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The Communication of Influence through Technology-Enabled Media

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The Communication of Influence through Technology-Enabled Media

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The Communication of Influence through Technology-Enabled Media

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Theory and research regarding interpersonal influence and communication media have conceptualized both in terms of contextual or a priori factors, situated action and interaction, or behavioral outcomes. Given the primacy of influence in collective action and the increasingly pervasive role communication technologies play in organizational settings, the goal of this study was to examine the relationships between influence and media from all three perspectives.

Perceptions of the context of media use in collaborative settings were described using self-guided focus groups and survey response data. A series of structured group experiences was then administered to create a collaborative problem-solving environment using one of three media capabilities: face-to-face, voice conference, and chat. Behavioral indices of influence were recorded during the structured group experiences to explore effects attributable to media. Finally, in-depth perceptual data was collected through semi-structured interviews to determine how media in use during the structured group experiences impacted interpersonal influence and the context in which that influence was expressed.

Results indicate that common experiences and perceptions of communication media were situated within a larger context of use, one in which media affect and are affected by relevant aspects of that context. Ten such contextual factors and the relationships between them were described and illustrated. Media were not found to account for any meaningful differences in behavioral indices of influence; the nature of those indices suggests that informational influence was independent of the medium through which it was expressed. However, media differences were responsible for pronounced effects on perceptions of influence when conceptualized beyond behavioral measures, as well as on perceptions and experiences of various elements of the context of media use and the environment in which influence was expressed and exchanged.

In general, variations in non-verbal sensory and feedback cues accounted for most of the perceptual findings. However, the nature of the effects, as well as other factors unrelated to non-verbal cues, suggested a functional perspective that was more informative for meaningfully discriminating between media and their effects: interactivity, social awareness, and propinquity. Practical and theoretical considerations are discussed in light of the obtained results.

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Chapter I - Introduction

Many studies of so-called "media effects," the variability of human responses to messages conveyed over different communication media (channels, methods, or technologies), agree that technology-enabled communication media can affect the extent to which individuals engage in communication at all, feel a sense of anonymity or individuality during interaction with others, focus on task or instrumental aspects of the communicative environment, exchange negative or uninhibited messages, and temper an individual's degree or amount of consensus-seeking behaviors (Hollingshead & Contractor, 2002). Such effects can manifest themselves behaviorally in any number of ways; especially in the ways we might communicate with others in order to more effectively achieve our goals. Such is the focus of the present study—to investigate how communication technology might affect or alter the ways in which individuals communicate with each other and perhaps even the environment in which such communication is rendered.

Of all the potential "types" or "classes" of communicative behaviors one might express or experience during the process of interacting with others, those associated with interpersonal influence are most proximal to goal fulfillment or attainment. Like any theoretical construct, *influence* can be operationalized in a number of ways which have vast epistemological and methodological implications for further study and analysis. Typically, however, influence is conceived of as an instrumental force or inducement exchanged between individuals for the purposes of changing or preserving specific behavioral or psychological states (Dillard, Anderson, & Knobloch, 2002; Meyers & Brashers, 1999).

Influence is a fundamental concept to the human experience because humans are first and foremost social creatures (Dunbar, 1996) possessing needs and desires they wish to satisfy—needs ranging from existence or basic subsistence and protection to self-actualization, growth and relatedness with others—yet are unable to fulfill on their own (Alderfer, 1972). Humans therefore turn to the communicative process to orchestrate and organize the efforts and resources of others to assist in the fulfillment of those various needs (Athay & Darley, 1985, p. 231).

In fact, it is the inherent "other dependency" of human action and existence that *necessarily* generates communication and information exchange between individuals (Athay & Darley, 1985; Dillard et al., 2002; Kellerman, 1992). Therefore, *the communication of influence*, how influence is symbolically represented and exchanged between individuals, can be construed as one of the most basic and fundamental concerns of human activity. Of course, some communicative behaviors may be expressed for reasons not maximally, or at least explicitly, tied to influence or need fulfillment. However, few behavioral activities seem as *directly* linked to the notion of influence as communication (Cartwright, 1959b), and recent scholarly reviews (Dillard et al.; Meyers & Brashers, 1999) concerning interpersonal influence suggest that influence itself is typically conceptualized and studied in decidedly verbal (or symbolic) terms.

A. GROUNDING THE RESEARCH FOCUS

Organizational, social, information, and communication scholars and scientists share a great deal of practical interest in the matter of interpersonal influence. For example, consider the various ways in which the processes of influence play out in modern organizations. Some managers or executives likely use directive, pressure, and even coercive tactics to secure the compliance or agreement of others. Others may use "softer" tactics to influence others, perhaps participatory management, flattery, or

ingratiation. Still others may adhere to a purely transactional mentality—stressing the importance of the exchange relationships inherent in work and compensation, the details of which the organizational members have mutually agreed. Finally, it is likely at least some of the influence processes enacted in modern organizations rely on rational, fact-based exchanges between individuals. Obviously, the range of potential actions and responses reach far beyond the few examples given here.

However, consider what an organization might look like if only one type of influence process was routinely employed between individuals. What sort of workforce might be attracted or retained if those seeking to influence others only used coercion or pressure tactics? How might organizational effectiveness be improved if only certain forms of influence were employed during those times when they were *particularly* appropriate to the situation? Finally, consider the notion of leadership absent from the consideration of influence over others—the concept itself becomes virtually meaningless, or at least practically useless, without some consideration of the means by which a leader actually leads, guides, or *influences* follower behaviors! Indeed, how one exerts influence over others can have a dramatic impact on personal or individual effectiveness (Kipnis & Schmidt, 1988) as well as the structure, culture, and success of the organization and organizational relationships (Cable & Judge, 2003).

Given the further potential for media effects to moderate human influence behaviors and communication, imagine how modern organizations might *better* employ their communicative resources—or individuals craft their messaging strategies to influence the actions of today's collocated and dispersed workforces—if they better understood how certain types of electronic communication systems were more conducive to (or naturally employed) certain forms of influence messages and communication and not others. Might executive travel demands be lessened if people knew that a video- or

telephone-conference could support an environment suitable for the same degree of buy-in they were seeking during face-to-face influence attempts? Conversely, could the interpersonal context of a face-to-face meeting be more appropriate for other kinds of influence attempts and necessitate even *more* face-to-face communication (Trevino, Daft & Lengel, 1990, p. 72)? Given the degree to which modern businesses and organizations depend on electronic communication systems to coordinate internal and external information flow, the importance of examining how technology-mediated communication media might impact the processes of influence become resoundingly clear.

B. RESEARCH QUESTIONS

However, the complexity of human thought, cognition, and social behavior means that the process or processes of influence most likely play out in a number of different ways, through verbal or non-verbal behaviors, through action or inaction, with intended or unintended consequences, and for a variety of goals or purposes. Amidst these many possibilities, two overarching questions bounded the present investigation:

1) *How does communication technology affect or change the nature of symbolic, communicative behavior aimed at influencing others?*
2) *How does communication technology affect or change the communicative context in which influence messages are produced and exchanged?*

This study specifically addresses the interplay between technology and the overt, symbolic behaviors and communicated messages commonly associated with the concept of interpersonal influence. This is not to say that non-verbal or non-symbolic factors are unimportant to a discussion to influence (see Ketrow, 1999, for a review of many such issues), only that symbolic messages and verbal behaviors are conceived of as more closely aligned with the symbolic and behavioral definition of influence (as it has been

commonly conceptualized in the literature). Therefore, influence messages were treated as the *behavioral outcome* of interest or communicative "unit of analysis."

Yet it is also clear that human behavior is not likely to occur in a vacuum. Specifically, Blumer's (1969) symbolic interactionist theory posits that individual behavior and interpersonal communication are shaped by the procedural, technological, and organizational capabilities at hand; for the purposes of this analysis, these factors were referred to as elements of the *communicative context*. Even more importantly, Blumer, and those sharing his socially constructed view of human experience, believe that our behaviors and communicative activities are shaped by the shared meaning of various concepts and constructs as produced and reproduced via the *action* and *interaction* between individuals. Therefore, this study also embraced the notion of influence in terms of the context for interaction, as well as part and parcel of the interactions themselves.

Along with a methodological focus on influence in terms of the *communicative context*, *action and interaction*, and *behavioral outcomes*, these three organizing principles were used to guide the selection and analysis of existing and representative literatures as shown in Table 1.

Communicative Context	**Action and Interaction**	**Behavioral Outcome**
Social Power	Constituted/constitutive perspectives on power	Influence messages
Majority and minority influence	Network position and centrality	

Table 1. Analytical Framework for Presentation of Influence Literatures

These categories were not meant to be exhaustive or mutually exclusive. For example, network position and centrality might reasonably provide a context for the communication of influence as well as a generative mechanism for influence based on the actions of, and interaction between, members of a given network. Such overlaps throw into relief the complex and interdependent nature of the communicative context and interpersonal action and interaction with the exchange of communicative messages of influence.

Chapter II - Existing Literature and Background for Inquiry

A. COMMUNICATIVE CONTEXT

1. Social Power

Social interaction is an inescapable fact of life—as are the various acts and practices of communication between and amongst members of social groups (Gouran, 1999, p. 3). Yet, of all the issues concerning group communication, few issues illuminate how individual members figure into group and social activity more than power and influence (Poole, 1999, p. 40). Moreover, the processes of power and influence can form the basis of problems encountered by individuals at every level of organizing, from group, to community, to society and beyond (Bruins, 1999). However, as the passages above illustrate, the individual concepts of power and influence are often uttered in the same breath within the research literature and are, as subjects of study in their own rights, inextricably related regardless of how artfully or explicitly the definitions are articulated (Cartwright, 1959a, p. 186).

Social power, or the *potential* to exert influence over others, stems from one's control over resources that another needs or desires (Kipnis, 1976 & 1990; Pfeffer, 1981). Furthermore, the degree or strength of that influence potential is determined by how dependent one person is on the other for satisfaction of those needs or desires (Emerson, 1962, p. 32). Such resource-dependency theories provide a picture of power relations that have relatively little to do with individual abilities or attributes. As Pfeffer notes, "Although individual skills and strategies can certainly affect the amount of power and the effectiveness with which it is used, power is first and foremost a structural phenomenon, and should be understood as such" (p. x). Thus, these power structures and

dependency relations define the degree or amount of influence one actor might come to exercise over another prior to any particular influence episode or exchange of influence messages.

A framework for understanding distinct *bases of social power* was described in French and Raven's (1959) study of the same name. These included the now relatively ubiquitous notions of coercive, reward, legitimate, expert, and referent power. Each of these types of social power describes a different dependency or resource-based relationship that is qualitatively different from the others, but it also introduces the notion that certain individual or socially constructed aspects of the interpersonal relationship may play out in power relations. In particular, coercive and reward power referred to an individual's ability to create or bestow positive and negative outcomes on others; legitimate power referred to beliefs that another has the legitimate right to exert influence while the individual has an obligation to accept that influence; referent power depended on a degree of affinity or identification; expert power concerned one's possession of superior knowledge or experience. Raven (1965) would later go on to add informational power to these antecedent conditions of social power, a form concerned not with the characteristics or traits of one person versus another within a particular context, but with the perceived relevance and validity of the information communicated from one person to another. In contrast to expert power, derived from the target's attribution of expert knowledge to another, informational power is rooted in the *actual content* of the messages communicated between others.

Assuming power stems from resource control, we should expect to find evidence of influence messages—the *behavioral outcome* and unit of study for this investigation—concerning individual or collective understanding of the possession or distribution of those resources, or of various expressions of needs, desires, or negotiations for resources.

Such messages would pertain almost exclusively to the exercise of pre-existing power structures and relationships, rationalizing and justifying decisions that are largely the result of those *a priori* conditions (Pfeffer, 1981, p. 184). Similarly, someone attempting to exercise a particular base of social power might communicate messages of influence by referencing that power base such as a veiled or direct threat signaling coercive power, or a show of skill or prowess to attempt influence through expert power means. An exchange involving messages high in informational power essentially taps the persuasiveness of the information itself. In this situation, influence messages communicated between individuals exert their force or inducement independently of the power bases possessed by the initiators or receivers of the message (Raven, 1965).

Unfortunately, theories of power articulated in terms of antecedent conditions (like those described above) privilege such issues as resource control or structural constraints above communication as constitutive of social power (Mumby, 2001). Therefore, in all but the simplest exchanges—ones in which the initiator attempts to influence another by directly referencing the elements of the resource-dependency relationship, or explicitly articulating some aspect of a particular social power base—one might be hard pressed to determine the "experienced nature" of influence messages beyond the literal meanings of the symbols exchanged between actors. For example, even a simple message such as "Will you please research this material for me?" may be influential in and of itself because of the way it was phrased, because of an affinity between the sender and receiver, or because of formal power structures that have already defined the working relationship between the sender and receiver. Thus, the degree to which issues of social power comprise the communicative context can only be so informative to an understanding of a particular behavioral outcome or influence message. As such, identifying the various sources of interpersonal power might provide richness

for an understanding of the communicative context; however, it falls somewhat short as a framework for more completely interpreting the entirety of a symbolic exchange or series of influence messages.

2. Majority and Minority Influence

The process of majority influence is classically regarded as the conversion or conformity of one person in accordance with the position or wishes expressed by others belonging to others comprising a majority (Meyers & Brashers, 1999; Meyers, Brashers & Hanner, 2000; Mucchi-Faina, Maass & Volpato, 1991). For example, Asch's (1951) popularly cited works indicated that people can be pressured into reporting an obviously incorrect answer regarding a physical stimulus based solely on the majority's expression of a divergent viewpoint. The result of this type of influence process, termed "convergence," is thought to occur only in the public domain or at the surface level, whereby overt behaviors suggest compliance even though the target does not actually internalize the majority position (Moscovici & Lage, 1976). Internalization, the latent or private agreement of the target with the majority position, is thought to be the result of processes associated with informational influence, the degree to which one person is persuaded by the information others provide, rather than their sheer numbers (Meyers & Brashers, 1999).

Theoretically, both forms of majority influence have been linked to dependencies between members of the minority and members of the majority (Nemeth & Wachtler, 1983). In particular, the forces of normative or convergent influence are thought to result from the majority's control of approval and disapproval; informational influence is tied to the majority's control of information about reality (Nemeth & Wachtler, p. 46). Expressed in these terms, the normative forces of majority influence bear a striking resemblance to the coercive and reward sources of social power discussed in previous

sections. Indeed, social approval or disapproval may be construed simply as a resource needed or desired by the minority and controlled by the majority; thus, the degree to which majority influence could result in convergence is directly tied to how dependent a minority member is for social approval (Emerson, 1962). Similarly, the informational component of majority influence is virtually identical to the notion of informational power as it is concerned with the persuasiveness of the information itself rather than having anything to do with characteristics of the actors involved or other contextual factors.

Because majority control of such "social resources" and informational influence does not rest with a single individual, studies concerning the forces of majority influence have yielded some unique insights regarding *how* such influence is communicated between individuals, something which the classical approaches to the study of social power provide primarily through inference. For instance, consistency of communicative messages is thought to be a key variable in the success of *both* majority and minority influence processes—consistency in the expression and presentation of preference or opinion statements, or consistency in the expressed valence for those preferences and opinions (Gebhardt & Meyers, 1994; Meyers et al., 2000; Moscovici & Lage, 1976 & 1978). Others have observed that minority members expressing opinions or viewpoints divergent from the majority are often met with hard or aggressive influence tactics from the majority members including pressure, derision, or ridicule, especially during the early stages of the interaction (Nemeth & Wachtler, 1983). However, minority influence has proven successful for the internalization of divergent viewpoints or opinions, but only when the arguments and persuasive appeals communicated to others are of high quality or originality as compared to those rendered from the majority position (Meyers & Brashers, 1999; Mucchi-Faina et al., 1991). Finally, Meyers et al. (2000) found that

successful minority subgroups were more likely than majority subgroups to express agreement or acknowledgement of others during their influence attempts, were more likely to object or challenge assertions and propositions, and make greater use of contextual or framing statements to qualify a point of contention, or forestall the possibility of potential refutation by securing additional *a priori* agreement or removing possible objections before they could be aired.

The fact that minority subgroups have been shown to employ significantly different approaches within a particular influence episode (than those belonging to a majority subgroup arguing for the same outcome) suggests that the processes of minority and majority influence may play out through slightly different interpersonal mechanisms. Perhaps we naturally attend to different communicative or perceptual "rules of play" when attempting to influence others from a majority versus a minority position? Regardless of the actual perceptual or social mechanisms at work, it is clear that issues of majority or minority positioning within the communicative context can play a key role in shaping communicative behavior aimed at influencing others.

Unfortunately, like the social power perspectives introduced above, studies of minority and majority influence treat the phenomenon as somewhat formulaic; what remains unclear is how such *a priori* conditions translate into ongoing action and interaction. Therefore, two new research streams will be discussed that conceive of communication as an integral component of action and interaction, borne of human behavior, but generative of behavior as well. Though influence per se was not commonly invoked in these particular literatures as the relevant "independent variable," such research was concerned with the kinds of issues associated with influence as it might be conceptually situated in action and interaction.

B. ACTION AND INTERACTION

1. Power as a Constituted/Constitutive Component of Communication and Interaction

Power seemed an especially relevant perspective to revisit because it was logical to conclude that while not every influence message necessarily stems from issues of power, any *exercise* or *expression* of power in symbolic or behavioral terms must, by definition, involve the communication of influence messages. Cobb (1984) provided such a departure from antecedent conditions and pre-determined perspectives on power by proposing episodic model stressing the *process* and *means* by which power was exercised. Cobb's model suggested that the selection and performance of certain behaviors in the context of situational constraints—and in light of certain antecedent conditions—would interact to create unique patterns and structures of power, as well as recursively influence the antecedent conditions of the original exercise of power itself. These factors would therefore affect not only how power was exercised in a given situation, but how it might be exercised in the future. The critical issue was that the antecedent conditions were no longer the *defining* dimensions of social power; communication and social interaction worked together to produce and reproduce power.

One of the more popular and thoroughly articulated theories of such intersubjective meaning and action (and meaning from action) is Giddens' (1979 & 1984) structuration theory (also discussed at length in DeSanctis & Poole, 1994; and Orlikowski & Robey, 1991). Structuration posits that social interaction and social processes such as communication and influence are important in both determining group outcomes and in mediating the effects of any particular aspect of the environmental or interpersonal structure (including power relationships) in group settings. Essentially, the very meaning and operation of social power structures are never fixed or invariant, though the group

may respond to or adapt certain aspects of the existing power structures to its own ends—much like a recipe for behavior and interaction. However, as individuals engage in communication and collective action, structures which support or guide human action are also produced and reproduced *from* human action.

Unfortunately, some of the difficulties associated with analyzing or even identifying communicative messages indicative of structurational process are the sheer number of potential structures and aspects of the interactions to which one must attend. For example, the factors hypothesized to influence power structures in the context of action can include characteristics of the group under consideration; the situation, task, and social context of that group; the individuals' degree of insight into the structures they are capable of enacting, using, or changing within a particular context; the distribution of resources; and the consequences and complexity of the interaction between individuals, their collective actions, and the environment. Moreover, interpretations and shared understanding of those factors are likely to exhibit fluidity as the social situations change in accordance with the situational demands (Orlikowski, 1996).

Herein lies one of the drawbacks of the structurational lens as it relates to a behavioral outcome—its scope is so broad that it provides a great deal of richness and understanding about the larger system of relationships and structures against which individual expressions of influence might play out, but its ability to explain a single instance of influence behavior is somewhat limited. For example, the basic tenets of structuration theory suggest that evidence of power structures in action might be found in discussions or discourses concerning variations in group processes and resources for which members *actually have control or ability to adapt and change*. Therefore, influence messages indicative of power structures in action might explicitly enact those structures, referencing the rules, resources, social norms, or exchange relationships that

have the potential to affect or structure communicative interaction and behavior. However, this is only half the picture as structuration is also a theory of how communication is *constitutive* of those structures. Consequently, one may not fully appreciate how power is communicated between individuals through influence messages unless the communicative interactions are themselves analyzed, as well as the *patterns* of interaction and the larger social context providing the structures and resources from which individuals draw during their exchanges.

2. Network Position and Centrality

Communication or interpersonal networks are often defined as the patterns of contact, activity, and communication between individuals. These patterns of activity, and the mechanisms responsible for their formation, transformation, and decay, help define modern organizational forms as well as the social landscape of our interpersonal relationships (Monge & Contractor, 2001). The types of relationship issues commonly associated with network perspectives concern such factors as closeness between individuals, prestige of the association, role of the individual within a larger network, strength of the connection between individuals, direction of the linkage (as related to structural aspects of the social context), or density of commonly shared network connections *en toto* (see Monge & Contractor, 2001, for a summary). However, what is arguably more important is how these relationships can affect social behavior and communication.

Indeed, one of the central themes of network research and analysis is that individual actors are embedded in larger social structures and networks of social relationships that both constrain and offer opportunities for various forms and enactments of individual behavior and collective action (Brass, Galaskiewicz, Greve & Tsai, 2004; Marwell, Oliver & Prahl, 1988; Mizruchi & Potts, 1998). For example, Brass and

Burkhardt (1993) observed that informal network centrality and formalized hierarchical position tended to exhibit differential effects the kinds of tactics and messages (both behavioral and symbolic) people used to influence others. However, network-based sources of influence also appear to result from the patterns of behavior associated with those network positions (and not just the positions themselves). These types of structures emerge over time as a result of action and interaction between members of an influence network until the patterns themselves (though informal) eventually become stable and persistent enough to constrain individual behaviors (Brass & Burkhardt, p. 444).

Though some literature in the network tradition has indeed tackled the subject of explicit influence message exchange and symbolic behaviors (e.g. Brass and Burkhardt, 1993), *the communication of influence* seems a more meaningful concept in terms of the relationships, exchanges, and connections between actors within the network, rather than the specific symbolic and communicative behaviors of those actors, or the information contained within the influence messages. In fact, the notion of a *social network analysis* is often articulated in terms of information exchange. Yet, these analyses are not concerned with information as symbolic communication per se.

Instead, information is conceptualized as a medium of exchange; it can be can be controlled much like any other resource and follows exchange "routes" through the network. Within a perspective such as this, those exerting more influence or exhibiting more effectiveness within the network do so because they are able to broker relationships that help gain awareness and exposure to existing sources of information, open new opportunities for exploiting that information, and change the way information flows to improve information delivery (Haythornthwaite, 1996). However, the specific nature of the information (if conceived of in terms of the symbolic messages exchanged during

these network-based transactions) is of little analytic importance—what is crucial is how and where it flows.

Based on this distinction, it seems clear that a more complete appreciation of how the process of influence "works"—from a network-centric perspective—should be more immediately concerned with how people build, leverage, evaluate, conceptualize or navigate their network relationships and linkages, and less concerned with verbal, symbolic behaviors which we might identify (from a perspective *outside* the network) as interpersonal influence. Stating the matter simply in network terms—influence *is* an exchange, not the subject or outcome *of* an exchange. To address the latter, the following section reviews relevant literature explicitly concerned with the communication of influence messages and influence behaviors.

C. Behavioral Outcome: Influence Messages

Goffman (1955) suggested that people consciously manage the impressions (or face) they convey during their interactions and communication with others. They also alter the impressions they present and the strategies they use in creating those images and faces based on both situational constraints and their desired outcomes. Consequently, it would seem a daunting task to characterize every type of "face strategy" or "face behavior" one might use for the purposes of influencing others. Nevertheless, research aimed at exactly these ends provides valuable insight into the universe of potential influence message choices and influence-inducing behaviors at our disposal (Dillard et al., 2002). For the most part, these influence messages are strictly verbal; however, from time to time, the extant research conceptualizes verbal influence messages as part of a larger class of "influence behaviors," all of which are symbolic, but may not necessarily involve the exchange of verbal messages per se. The following discussion will address some of these more prominent works within the influence messaging tradition.

1. Dimensions and Categories of Influence Messages

Falbo (1977) observed conceptual similarities and relative dimensionality through which subjects differentiated between potential influence messages; Falbo described these dimensions in terms of the messages' *directness* versus *indirectness*, and *rationality* versus *irrationality*. Dillard, Wilson, Tusing and Kinney's (1997) review of similar studies found evidence for at least three dimensions of conceptual differentiation which seemed to hold constant across the literature. *Explicitness* was the extent to which the goal of the influence message was made clear within the communicated message itself. *Dominance-submissiveness* represented a dimension capturing the relative power relationship between the message source and receiver as expressed in the message itself. Finally, *argument* was the extent to which the rationale for the desired action was included in the influence message.

Marwell and Schmitt's (1967) study represents one of the more well-known categorical approaches to studying influence messages. Using measures of subjects' likelihood to employ a specific type of influence behavior, the authors developed a five-factor model of compliance-gaining techniques: *rewarding activities*, *punishing activities*, invoking *expertise*, activating *impersonal commitments* (such as those based on legitimate authority), and activating *personal commitments* (such as those based on liking for another person). Unfortunately, such classification schemes largely left scholars and practitioners to their own devices for devising or inferring exemplars of influence messages that would prove more or less effective than others in practice. Thus, the next set of literatures takes a more tactical approach in its efforts to identify specific *types* of influence messages and behaviors.

2. Inventories of Influence Messages and Behaviors

Kipnis, Schmidt and Wilkinson's (1980) work is typically regarded as one of the foundational studies for establishing a specific inventory of influence behaviors which was later formalized into the Profile of Organizational Influence Strategies (POIS) (Kipnis & Schmidt, 1988; Schriesheim & Hinkin, 1990). These behaviors included:

1. *assertiveness*: demanding, ordering, and setting deadlines.
2. *ingratiation or friendliness*: weak/non-obtrusive tactics, acting humble, making other person feel important.
3. *rationality*: writing a detailed plan, explaining reasons for request.
4. *sanctions*: administrative sanctions; preventing salary increases, threatening job security.
5. *exchange*: exchange of positive benefits, offering to make personal sacrifices.
6. *upward appeal*: bringing additional pressure for conformity by invoking influence of higher organizational levels, making formal appeal to higher levels, obtaining the informal support of higher-ups.
7. *blocking*: stopping a person from carrying out some action, engaging in a work slowdown, threatening to stop working with someone.
8. *coalitions*: pressure for compliance by obtaining support of co-workers.

The practical value of this work lay in the inventory of empirically generated and concrete actions one might take for the purposes of influencing others. Moreover, the strategies were developed based on the shared experiences of those in organizational settings and thus were at least somewhat likely to be indicative of commonly successful influence strategies.

Other contemporary study has produced the Influence Behavior Questionnaire (IBQ) (Yukl & Falbe, 1990; Yukl, Falbe & Youn, 1993; Yukl & Tracey, 1992) containing many similar strategies and influence message types to the POIS. In particular, the IBQ identifies the following influence messages common to organizational settings:

1. *rational persuasion*: using logical arguments and factual evidence to persuade the target that a proposal or request is viable and likely to result in the attainment of task objectives.
2. *inspirational appeals*: making a request or proposal that arouses enthusiasm by appealing to target's values, ideals and aspirations, or increasing self-confidence.
3. *consultation*: seeking participation in planning a strategy, activity, or change for which target support and assistance are desired, or the agent is willing to modify a proposal to deal with target concerns and suggestions.
4. *ingratiation*: using praise, flattery, friendly, or helpful behavior to get the target in a good mood or to think favorably of him or her before asking for something.
5. *personal appeals*: agent appeals to target feelings of loyalty and friendship.
6. *exchange*: agent offers an exchange of favors, indicates willingness to reciprocate at a later time, or promises a share of the benefit if the target helps accomplish a task.
7. *coalition tactics*: agent seeks the aid of others to persuade the target to do something or uses the support of others as a reason for the target to agree.

8. *pressure*: agent uses demands, threats, frequent checking, or persistent reminders to influence target to do what he or she wants.
9. *legitimating tactics*: agent seeks to establish the legitimacy of a request by claiming the authority or right to make it or by verifying that it is consistent with organizational policies, rules, practices or traditions.
10. *upward appeals*: seeking to persuade another that the request is approved by higher management, or appeals to higher management for assistance in gaining compliance.

Interestingly, some organizational researchers in this realm have gone so far as to distinguish a particular *kind* of influence and influence behavior; specifically, political influence behaviors (PIB). Such research is aimed at identifying those behaviors which influence others with the express purpose of enhancing or protecting the self interest of a particular group or individual (Allen, Madison, Porter, Renwick, & Mayes, 1979). These behaviors include:

1. *blaming or attacking others*: scape-goating, minimizing or avoiding association with an undesirable situation or result, or reducing competition for scarce resources and making competition look bad.
2. *use of information*: withholding, distorting, or overwhelming others with information.
3. *creating and maintaining a favorable image*: promoting self-interest, drawing attention to positive attributes, taking credit for others' success.
4. *developing idea support*: getting others to understand an idea before a decision is made or getting others to contribute to an idea to ensure commitment.

5. *ingratiation*: praising others.
6. *power coalitions*: building a base of support with strong and influential allies.
7. *associating with the influential*: both business and social associations.
8. *reciprocity*: performing services or favors for creating obligations.

Of particular note is how many the various influence behaviors and messages seem to echo the underlying mechanisms expressed in the network-centric perspectives of influence. The strategies of *upward appeals, ingratiation, exchange, associating with the influential, coalition tactics, creating and maintaining a favorable image,* and *blaming and attacking others* could certainly manifest themselves in symbolic message exchange; but they also seem to speak to the kinds of efforts associated with cultivating, maintaining, or altering relationships with specific others operating within a communication network. Moreover, strategies such as *use of information*, *developing idea support*, *rationality* and *blocking* seem to tap notions of controlling information flow within a network and creating opportunities for exploiting that information.

Despite this seemingly impressive array of influence message types or behaviors to choose from, one of the theoretical difficulties of this particular line of research is that the emphasis is on describing a stable of behaviors and messages which *could* be influential; little thought is given to how these messages might actually be perceived or received *in situ*. For example, it has been proposed that culture exerts a wide range of normative forces and constraints on behavior, communication, and individual cognition (Hofstede, 1991). Assuming this is so, would *sanctions* or *blocking* figure as prominent influence strategies for persons of collectivist cultures as they had for those of an individualistic culture (such as the participants in Kipnis et al.'s (1980) research)? This additional consideration about the communicative context, as well as the degree to which

such messages seem grounded in human action and interaction (as discussed in the previous paragraph), suggest that a more complete perspective encompassing all three components of the present analytical framework would provide greater insight into the efficacy of these specific types of influence behaviors across situations and settings.

Yet, there is clearly conceptual overlap between the social-psychology and organizational approaches to the study of influence messages and influence behaviors. Indeed, any of the influence strategies above could be arrayed along dimensions of *explicitness*, *dominance-submissiveness*, and *argument* once a specific message or behavior was isolated and analyzed for explicit or symbolic content. Moreover, the degree of similarity between approaches provides enough common ground to facilitate comparison across investigative contexts. Such conceptual similarities are highlighted in Table 1 for all influence message types or influence behaviors common to at least two of the three inventories discussed in the preceding sections.

Influence Tactic/Strategy	Profile of Org. Influence Strategies	Influence Behavior Questionnaire	Political Influence Behaviors
Rationality/Rational Persuasion	X	X	
Inspirational Appeal		X	
Consultation/Idea Support		X	X
Ingratiation	X	X	X
Personal Appeal		X	
Exchange/Reciprocity	X	X	X
Coalition Tactics	X	X	X
Pressure/Assertiveness	X	X	
Legitimating Tactics		X	
Upward Appeal	X	X	
Sanctions	X		
Blocking	X		
Blaming/Attacking Others			X
Use of information			X
Creating/Maintaining Favorable Image			X
Associating w/the influential			X

Table 2. Conceptual Similarities between Influence Message Research

Again, some of the same problems associated with the dimensions and categories research are applicable to this line of thought. Of paramount concern is the fact that contextual impact is nearly impossible to disentangle from any of the research findings simply because the available means of influence and persuasion necessarily varies from context to context (Roloff, 1994). For example, a person's role as a parent, child, or sibling renders some means of influence over others available in certain settings and familial contexts, but one clearly might not use those exact same means and methods of influence in a job or professional setting. Therefore, the best one could hope for is an idea of which sorts of influence messages *might* be useful in a given context rather than which ones were available for use at all.

From communicative context, to action and interaction, to the communication of influence messages themselves, the intellectual terrain surrounding interpersonal influence is undeniably vast. Indeed, the research cited thus far has merely provided a snapshot of representative thought and study, but is by no means exhaustive on the subject. However, it will be shown that regardless of which conception of influence or research perspective is adopted, the introduction and use of communication technology can dramatically affect the outcome of these many "influence equations." Thus, a brief review of relevant technology-related research will be provided in the following section.

D. Media Effects: Introduction and Use of Communication Technology

1. A Priori/Objective Perspectives of Media Selection and Use

Similar to the notions of *a priori* power structures and power relations are theories of media selection and use that posit similar *a priori* media features or capabilities that constrain or dictate the kinds of messages exchanged between individuals. These theories of media choice suggest that different communication media vary along objective

dimensions of relevance to the communicative process, and that successful use of such media reflect an appropriate match between communicative objectives and media capabilities. For example, social presence theory (Short, Williams & Christie, 1976) suggested that communication media varied along a continuum that enabled interpersonal interaction. Social presence per se was conceptualized as the degree to which one individual was salient to another via a particular communication medium. This salience was further believed to be commonly recognized and understood, and therefore comprised an objective dimension of comparison (one which could persist through the numerous advances and introductions of new communication technologies and media). As such, individuals were thought to make rational decisions regarding their media choice, selecting a communication medium commensurate to the task at hand.

Fitting closely within the social presence mold was media richness theory (Daft & Lengel, 1986; Daft, Lengel & Trevino, 1987), one of the most influential theories of media choice in the organization and information sciences (Markus, 1994a, p. 503). Media richness theory suggests communication media selection and use is due to user perceptions of media richness, another objective dimension of the communication media themselves. Media richness (also referred to in the literature as information richness) was defined as the ability of a particular medium to provide multiple verbal and non-verbal cues, immediate feedback, and support multiple modalities (text, audio, video) during communicative interaction (Daft & Lengel; Daft et al.). The greater the degree to which these factors were afforded or supported by a particular channel, the richer the information that medium was capable of conveying.

The role of rich information was to change a recipient's understanding within a given amount of time—richer information was faster and more capable than lean information to affect a person's cognitive states regarding a given subject or topic.

However, media richness theory also suggested that various information processing tasks could be objectively arrayed along dimensions of both equivocality (determining an appropriate problem to address) and uncertainty (determining the correct answer to a particular problem). Equivocal tasks would require more rich information for resolution; leaner information was appropriate for uncertainty reduction.

The role of the medium in reducing equivocality was therefore the exchange of rich information; media higher in richness such as face-to-face or telephone communication were preferable to leaner media such as written memos. The role of the medium in uncertainty reduction was the ability to transmit correct information. Media selection was therefore a result of the match between a medium's degree of richness and a communicated message's potential to reduce equivocality or reducing uncertainty in others, a relationship often referred to as the "task-fit" (Lengel & Daft, 1988).

Despite continued popularity of these rational-choice models and their permutations and extensions, research has yielded mixed support for perspectives based on the assumption that objective media characteristics *alone* account for media effects on communicative interactions (El-Shinnawy & Markus, 1992; Lee, 1994; Markus, 1994a). In addition, the primacy of uncertainty reduction in one's communicative behavior and media selection assumes a somewhat narrow perspective of both human behavior and the role information plays in our social relationships. In particular, this "Shannon and Weaver-esque" or conduit-like approach to communication tacitly assumes that communication media are merely linear transmission vehicles with varying degrees of social presence or richness inherent in the media themselves, regardless of who uses them or when (Hollingshead & Contractor, 2002).

Furthermore, these theories of media selection and use posit that usage behaviors are based on active information processing (Timmerman, 2002). However, it has been

suggested that a good deal of our communicative behavior—including communication media selection and use—is the result of over-learned or automatic responses into which active information processing does not figure (Kellerman, 1992; Langer & Piper, 1987). It is also true that the organizational environment and communicative context in which many media selection decisions are made do not necessarily present a simple problem space of singular uncertainty or equivocality, or even of singular modalities within the available media.

However, it seems at least some critics of these theories tend to gloss over the fact that media richness theory (in particular) was first a theory to explain how *managers* make media selection decisions, not a generic theory of media selection across all interpersonal or social contexts. This point is an important one because communication is the primary process by which managers conduct their work (Trevino et al., 1990), and it has been suggested that communication itself can be construed as an inherent exercise in interpersonal influence (Kellerman, 1992). Therefore, though they are not articulated as such, theories such as media richness and social presence are first and foremost *implicit theories of interpersonal influence*—the resulting media selection accounted for by each theoretical framework is merely a prelude to increasing the *likelihood* of influencing the message recipient or recipients.

Regardless of their detractors, objective media characteristics theories tell us that certain communicative exchanges should (or will) take place through some media and not others, and thus provide a framework that indicates where we might look for particular kinds of influence messages. For example, if someone wishes to influence another within a context of high equivocality (where it is unclear even what the appropriate courses of action might be), objective theories of media selection tell us they are more likely to convey their influence messages via rich media such as face-to-face communication than

leaner media such as bulletin boards or voice mail. Media richness and social presence theories also suggest, for example, that someone holding a position of legitimate power over another, or possessing the mutually understood ability to bestow favorable or unfavorable outcomes, operates in a context of low uncertainty. Specifically, there is little question as to why the target should comply with a particular influence message. As such, the initiator of a particular influence message in this situation may not require a very rich or "high bandwidth" medium to communicate and change the recipient's level of understanding, and therefore is more likely to exchange influence messages on media of lower richness or social presence.

Clearly then, the objective theories of media richness may help orient one to the location of the influence messages of interest amidst a sea of alternative media. In addition, they can provide grounds for inference as to the content of those messages. For example, in situations of high uncertainty or high equivocality, influence messages sent through channels low in richness or social presence would likely require explicit appeals to the agent's control of valued resources or bases of social power. Using media of greater richness, such as a video conference or face-to-face communication, contextual cues can be communicated or represented through means other than verbal influence messages—control of the physical environment, inflection, body language—and therefore might not need to be explicitly enacted within the influence messages themselves. These *a priori* theories of media selection and use provide an empirical foundation from which to launch more pointed and focused analyses that can target what technology changes about influence messages, and not necessarily just where or how they are exchanged.

2. Communication Technology and Majority-/Minority-based Influence

Individuals engaged in groupware or computer mediated communication (CMC)-based activities have often been observed to participate more equally in group communication than otherwise observed in face-to-face interactions (for a summary see Scott, 1999). This increased participation may well affect the consistency of communicated messages as both majority *and* minority influence were improved when the expression of preference, valence, or opinion statements were presented in a consistent fashion during intra-group communication (Gebhardt & Meyers, 1994; Meyers et al., 2000; Moscovici & Lage, 1976 & 1978). If communication technologies have the potential to equalize participation rates in groups, individuals simply have more opportunities to express their ideas and preferences, or more time to better compose those ideas to be even more effective before entering them into the collective consciousness of the group (Williams & Wilson, 1997). In addition, it has been suggested that using communication technologies to equalize minority contributions relative to majority inputs may stimulate both divergence and originality of collective thought production, a mechanism also theorized as a key component of minority influence (Mucchi-Faina et al., 1991).

A great deal of research also points to the possibility that communication technology can reduce social pressures and deregulate the social context due to a lack of social and interpersonal cues typically employed during face-to-face communication (Sproull & Kiesler, 1986). These effects have been attributed to the leanness or social bandwidth of the media themselves or the features of the media themselves which allow for unique conditions of communicative exchange, anonymity being the most commonly cited and studied within the relevant literatures (Postmes & Lea, 2000). It is theorized that without these cues to help establish decorum, roles, status differentials, and affective

states of the communicative partners, CMC-based communication is often prone to center more on task than socio-emotional issues (Hiltz, Johnson & Turoff, 1986; Walther & Parks, 2002). Such a tendency to shift away from socio-emotional concerns through CMC might be used to tip the scales of group influence in favor of a minority subgroup member because overall group influence and leadership has been found to be attributed to those individuals who engage in more task-related and task-process communication (Pavitt, 1999). It is also suggested that the reduced social cues and anonymity inherent in CMC channels tend to make people feel socially insulated and free to express themselves in a manner divorced from traditional social mores and restrictions (Sia, Tan & Wei, 2002), or from the expectations associated their own social identities (Spears, Postmes, Lea, & Wolbert, 2002). This freedom of expression can obviously have positive effects for the processes of minority and majority influence such as reduced communication apprehension or fear of reprisals for participation in group discussion at all (Postmes, Spears & Lea, 2002).

Unfortunately, the use of communication technology can also have negative consequences including social isolation, depersonalization, and the devaluation of others (Kraut, Lundmark, Patterson, Kiesler, Mukopadhyay, & Scherlis, 1998; Markus, 1994b). One of the more common negative outcomes associated with CMC use particularly relevant to the previous discussion of majority and minority influence is negatively or destructively uninhibited behavior, especially the now all-too-familiar phenomenon of "flaming," extreme emotional communication marked by insulting, offensive, and hostile comments and inflammatory interactions (Siegel, Dubrovsky, Kiesler & McGuire, 1986). These factors could manifest themselves in both majority and minority exchanges in terms of increased criticalness of others (Reinig & Mejias, 2004), as well as account for the more aggressive influence messages and tactics observed by majority subgroup

members during their confrontations with the minority (Nemeth & Wachtler, 1983). Such propensity for negative or flaming behavior may also explain why minority influence attempts have been shown to require considerably greater quality or originality to exert influence or engender internalization (Meyers & Brashers, 1999; Mucchi-Faina et al., 1991).

3. Technology in Constituted/Constitutive Contexts of Interaction and Communication

Moving beyond the purely objective and *a priori* theories of media selection and use, some theorists have borrowed elements from the symbolic interactionist perspective (Blumer, 1969) positing that individuals conceptualize and respond to elements of the world around them based on the *shared* meaning of those elements—meaning produced and reproduced via the interaction between individuals in socio-behavioral contexts. In particular, an individual's use of a particular communication medium has been theorized to be due in part to their understanding of the symbolic significance of the medium itself, and not simply because it is carrier of messages used to create meaning about other concepts (Trevino et al., 1990). Incorporating such ideas, as well as those inspired by Giddens' (1979, 1984) structuration theory, Poole and DeSanctis (1990) first proposed Adaptive Structuration Theory (AST) to specifically address the processes by which some individuals come to use technology in unexpected or unintended ways, and to show how the same technology can come to be used in different ways in different settings despite the intentions of having that technology support the same activities or functions (DeSanctis & Poole, 1994).

In particular, AST posits that technologies and communication media represent a set of social rules and resources which can constrain or enable various forms of social interaction and communication based on the ways in which certain aspects of that

technology are incorporated into the social context. For example, a group calendar system with a polling function or a collaborative white board embodies certain assumptions and expectations about the way in which collective action and activity might (or should) be accomplished and coordinated. However, if the boss' calendar is not shared with the rest of the office, the symbolic meaning of that gesture may have more to do with the intra-office relationships than the fact that the calendar *could* be made available because the technology allows it to be so.

These types of assumptions, resources, and constraints are implicit in the design of the technology itself. The way in which those assumptions fit into the social context of technology use is a property termed "spirit," that is, the emergent interpretations within the organizational context and associated structures about how and why to use the technology (DeSanctis & Poole, 1994). The emphasis on the emergent or dynamic aspect of technology use makes it unlikely that any particular group of people will use a particular technology or communication medium purely in its pre-existing form. Instead, they will adapt the technology for their own uses based on the pre-existing structures the technology supports, and those structures for which the technology is capable of affecting change. The process of selective use and local adaptation of technology are termed "appropriation." Faithful appropriation describes the adaptation and use of a technology in a fashion consistent with the structural features or spirit of the technology itself.

However, it is also possible that structural aspects of the social environment in which the technology is embedded can affect a group's appropriation of communication technology. For example, group support systems often are designed with the intent to help promote open discussion and collaboration. Yet, some individuals may use certain features of the system such as voting or private chat rooms to prematurely cut off the free exchange of ideas or covertly redirect attention and resources away from the matters

discussed in the open forum. Such technology appropriation moves represent the unintended or ironic consequences of technology use in socially constructed environments, and are very clearly the result of the interpersonal negotiation or invocation of various structures (such as power) endemic to the social context.

The complexities of communication technology use in natural settings indicate that history, work routines, cultural norms, social and exchange relationships, and a highly localized interpretive and behavioral context, all have the potential to dramatically affect the way communication technology is used, and how the patterns of interaction form around such use. However, communication technology also has the potential to transplant new structural features into the social context by way of the spirit embodied in its features and functions. This spirit may include structural features and modalities that were not previously part of the communicative landscape, but could be adapted or appropriated to produce or reproduce new structural features in the social context.

Consider how the blind courtesy copy feature in an e-mail could be used to circumvent the normal chain of authority, alerting someone higher up in the organizational structure to a problem or exchange brewing in the lower ranks to which they would not normally be privy. However, by bringing this matter to the attention of the superior, the initiator may be exercising power over the outcome of the situation, especially if he or she knows what the likely response will be. Yet, the anonymous nature of a blind-courtesy copy could insulate the initiator from repercussions if it was not obvious from the electronic "paper trail" who had alerted the superior to the problem. In another interpretation, the initiator may be attempting to establish trust with the superior, or set up an exchange relationship based on the knowledge provided in the e-mail, all of which could potentially alter the relational and power structures for the next interaction.

An AST-based perspective would clearly help explain the processes at work behind the scenes of the scenario just described—*how* and *why* influence communication takes place—even if it is less clear on the matter of *what* might constitute messages of influence within that scenario. Another perspective bound in the actions and interactions of others—network position and centrality—tells even less about the *exact* form, structure, or content of influence messages. Yet, what it lacks in such specificity it makes up for by providing a completely different perspective that further expands the scope and richness of our understanding regarding how influence is communicated between individuals, and how communication technology can affect such interaction.

4. Communication Technology: Reaching Within and Beyond the Network

According to Reed's Law, the utility of large networks, particularly networks capable of supporting social interaction, increases exponentially with the size of the network. Specifically, the number of sub-groups that can form within a network of participants grows more rapidly than either the number of participants themselves, or the number of possible connections between any two participants in the network (Reed, 1999; Rheingold, 2002). Therefore, one of the ways in which communication technology affects network-centric influence is to increase the salience and availability of the connections between these individuals and network subgroups.

Consider that any one individual's close or strong relationships are far less numerous than their weak relationships (Friedkin, 1982). Using the speed and processing power of modern communication technology—broadcast technologies to reach out to others, and powerful search technologies to locate relevant others—individuals simply have more "helpers" or greater access (statistically speaking) to resources and resource controllers, all of which increases their probability of success in any one particular endeavor situated within social and network contexts. Similarly, communication

technology can give those who control valued resources more avenues for interpersonal contact and access to potential resources seekers, thereby increasing the number of, or likelihood of generating, additional resource-dependency and exchange relationships. The more such avenues are opened by technology, the further the range and scope of influence exchanges and linkages are likely to reach.

Though Reed's law describes the potential for network-based influence in mathematical terms, behaviorist approaches often attribute such processes to the brokerage of "social capital" and the network phenomenon of structural holes (Burt, 1997; Monge & Contractor, 2001). Specifically, Burt argues that people accumulate social capital which includes network-based access to information beyond what one might possess alone, timely access to that information relative to others of structurally dissimilar positions within the network, and referrals to others within the network that casts an individual's interests in a positive light. Structural holes are simply places in the network where other individuals are unconnected. Those who successfully invest their social capital by filling structural holes gain not only direct linkages to the information flowing between network subgroups on "both sides of the hole," but also create additional informational value for themselves because they now control indirect flows of information between network subgroups.

However, given the sheer size and complexity of such networks and various strong and weak-tie relationships that comprise them, the speed and processing power of communication technologies might facilitate goal attainment or improve performance by providing access to shared knowledge within social networks *and* by managing information about the social networks of those who produced that knowledge (Thomas, Kellogg & Erickson, 2001). In this respect, it is not simply a matter of sheer numbers that might account for network-based exchanges of influence, but access to diverse, non-

redundant, or superior resources within other networks (Lin, Ensel & Vaughn, 1981); that is, investing one's social capital in more *effective* places throughout the network, rather than simply in more diffuse or numerous places.

Again, information or communication technologies have the capability to affect these types of network investments and activities as well. For example, recommender systems and collaborative filtering technologies can surreptitiously (or overtly) gather, cluster and analyze the activities or recommendations of individuals. They can then provide others with navigational cues indicating the presence and location of important information in the environment of which they might not otherwise be aware, as well as translate the various formats and protocols in which this information was authored and stored to make such information available at all (Tiwana & Balasubramaniam, 2001). Recommender systems such as Amazon.com's "more like this" feature and Google's priority ranking of web pages (based on the degree to which *other* sites point to those pages) are also examples of how communication technologies can change the flow of information within an influence network by managing or capturing the nature of the linkages between members of an influence network.

Finally, the introduction and use of communication technology can do more for network-based mechanisms of influence than simply increase the number of network linkages or facilitate the formation of the right "kinds" of links; it can change the very structure or nature of the network itself. For example, through one's face-to-face communication network, an individual may acquire and use a new text-messaging appliance. Once in use, new networks and network members become available through this medium that might not have been part of the original face-to-face network. However, usage of the appliance in the original network may also grow recursively thanks to continued face-to-face interaction. The resultant interaction between network members

and network-capable media may enlarge or modify the original face-to-face network, restructure the network of contacts available through text messaging, or create an entirely new network based on a combination of factors (Contractor & Eisenberg, 1990).

Many scholars in a number of applied disciplines have also long held that communication and information technology can lead to a flattening of organizational structure (Gurbaxani & Whang, 1991; Malone, Yates & Benjamin, 1987). This transformation is theorized to be the result of, among other factors, decreasing transaction costs (in terms of time, resources, or even social capital) associated with seeking, establishing, and maintaining network linkages. In particular, the structural distinctions of who can talk to whom in a networked context become less relevant in technology-enabled contexts because the marginal transaction costs of generating those network linkages are greatly reduced, and the connectivity offered by communication technology increases the marginal utility of each additional link formed.

Indeed, evidence suggests that although people are sensitive to hierarchical differences in network structure when communicating with others, they often use technology to bridge inter- and intra-organizational boundaries, thereby rendering some of those pre-existing hierarchical distinctions meaningless (Hinds & Kiesler, 1995). Therefore, technology can not only be an enabling or constraining force of network interconnectivity, its effects can actually provide a transformative force for altering or creating new network structures. In the final section of this review, the remaining bodies of associated research will be discussed. Unlike the previous literatures, these studies have directly addressed the effects of communication technologies on the behavioral outcome of interest and therefore serve fitting capstones to an overall discussion of communication technology and the communication of influence.

5. Technology and the Communication of Influence Messages

The few studies that have directly examined the choice of specific influence messages as a function of communication media did so in part under the auspices of the antecedent conditions theories of media selection and use (such as social presence or media and information richness theories), and often attribute any differences to the relevant richness or leanness of the media, or the salience or lack of social cues the media afforded. For example, Wilson (2003) found that subjects felt relatively unencumbered by communication technology when trying to influence others using reward or coercive influence messages, but had greater difficulty rendering influence attempts based on both emotional and rational arguments through CMC. Among other factors, this may have been due to the fact that reward or coercive influence messages carry a greater degree of inherent or contextual explicitness that need little in the way of further explanation or illustration; emotional and rational influence attempts may require additional time and effort (typing, lack of immediate feedback) to negotiate through computer-mediated and asynchronous channels.

Similarly, Sussman, Adams, Kuzmits and Raho (2002) found that people did differentiate between their media alternatives when initiating self-serving, political behaviors and messages and when communicating their regular, work-related messages. In particular, political behaviors were overwhelmingly enacted through face-to-face communication, lending credence to the notion that a complicated interpersonal processes such as generating or executing political influence might require a communication medium of high interpersonal or social bandwidth (or greater richness) than something like e-mail or the telephone can provide. However, of those political messages which *were* exchanged through varying media, *creating obligations and reciprocity* and *developing allies and coalitions* were primarily enacted through face-to-face or telephone

communications, whereas using information as a tool was far more likely in memo or e-mail formats. Such results may well have been the result of either information richness or social presence processes at work.

For example, *using information as a tool* may require little in the way of social cues to sway a potential target of influence—the information communicated within the messages speak for themselves. However, *creating obligations* or *building coalitions* with others are necessarily social activities and endeavors, and thus are likely to require media of greater social presence such as the telephone or face-to-face communication. Similarly, the complexities associated with developing exchange relationships, or cultivating and organizing the support of a number of different people, are activities arguably high in equivocality and should (according to media richness theory) therefore be conducted through media of greater richness than could be afforded by lean media such as e-mail or written memos.

The research literature has also demonstrated a number of occasions in which the introduction or use of communication technology in a particular context afforded its users new, unplanned, or unintended benefits which were then employed for the sake of influencing others. For instance, Williams and Wilson's (1997) field study of groupware users reported that individuals actually preferred the asynchronous groupware environment to face-to-face meetings for the purposes of exerting influence because it gave them more time to better express or articulate their thoughts. In addition, it allowed users to express their ideas free from interruption or undue influence from others. Fish, Kraut, Root, and Rice (1993) further noted that a desktop video conferencing system designed to improve informal communication was also used by students to maintain an open and surreptitious "video drop" on their mentors' empty offices. When they returned, the students were able to waylay their mentors into private conversations they would

otherwise have been unable to schedule; Erickson, Halverson, Kellogg, Laff, Sussman, and Wolf (2002) also observed similar types of influence messages during the use of their experimental persistent chat client in a distributed office setting.

E. INTEGRATION OF RESEARCH LITERATURES: BUILDING THE RESEARCH FRAMEWORK

Regardless of the research tradition or perspective on influence discussed in the sections above, the introduction and use of communication technology into the equation has consistently proven more than simply an extraneous variable or "background noise" in the data for which the researchers had to account. The use of communication technology has been shown to alter many aspects of the communication of influence in symbolic and behavioral terms, in its contextual meanings and impact, and as an aspect of human interaction generative of, and generated by, communication itself. However, it seems clear that the interplay between the ways we think about influence, communicate messages of influence, and the media and technologies used to support the communication of those messages, are each difficult to examine in isolation. Therefore, the present study was built around a research framework that drew from all three elements of the analytical framework described within the various literatures and research streams above: the *communicative context*, *action and interaction*, and the *symbolic exchange of influence messages*.

1. Communicative Context

This portion of the research framework was conceptualized as an amalgam of the many contextually bound and idiosyncratic issues that are relevant to the communicative activities occurring in a small group. Based on the research and literature already reviewed, these contextual factors could have included (but were not limited to): communicative and social norms, formal and informational social organization, collective

group history and individual experience, group member motivations, and any other factors which are commonly or inter-subjectively understood to affect group interaction. The selection of a small group setting was informed by Putnam and Stohl's (1990) bona fide groups perspective and Poole's (1998) observations regarding small groups and small group research. Their conclusions suggested that a small group setting may include, among other factors: the persistence of a social reality extending beyond a single dyadic encounter; a greater complexity of the surrounding social context; the possibility for emergent properties within the group beyond the sum of the group's constituent characteristics; and communication that simultaneously affects and is affected by permeable and dynamic group boundaries and interdependence with multiple contexts.

These properties of small group communication have the potential to provide a great deal contextual richness for the study of the communication of influence and the effects of technology use. However, due to the dynamic and contextually dependent nature of such factors *in situ*, it is often difficult to know a priori which *specific* elements of the communicative context might be relevant "enough" to the study of such phenomena to be included in the investigative framework. For example, accounting for too many issues in the study design may make the act of inquiry itself too cumbersome or the results seem too idiosyncratic; too few may belie the complexity of the relationships and phenomena under investigation.

The literature summarized above merely hints at the entirety of multi-disciplinary research one might consult in designing a study to examine the communication of influence and the effects of technology use. Based on a cross-section of such research, one might make an intuitive or educated guess as to which elements of the communicative context were *most* relevant for a particular study or research objective (assuming the goal was to make such a study as inclusive as possible). However, the

current research objectives included consideration for the context itself, as well as the influence messages exchanged within that context, and technologies used to support those exchanges. Therefore, it was important to make certain methodological decisions and allowances that would (theoretically) provide for the identification and study of relevant aspects of that context—rather than specifying which aspects would be studied from the outset. Therefore, the explicit definition of communicative context was based on the mutually negotiated and socially understood experiences and perceptions of members of small groups as they engaged in their communicative activities.

2. Action and Interaction

The interplay between socially constructed meaning, communication, action, and contextual structures, resources, or frameworks—such as those discussed in Blumer's (1969) symbolic interactionism or Adaptive Structuration Theory (DeSanctis & Poole, 1994; Poole & DeSanctis, 1990)—suggest that communication technologies and communication media can represent a set of social rules or resources which constrain or enable various types of social interaction and communication based on the ways in which certain aspects of the technologies are incorporated into the social context. To allow for the exploration of shared and negotiated meanings of the various structures and actions within that context, including technology and the way it figures into individual and collective cognitions and action, the research framework included a temporal component; a task that provided impetus and rationale for action and interaction; and a subject technology or medium through which that interaction occurred.

The temporal component was operationalized through a longitudinal setting; groups met together several times in a row to accomplish a series of tasks. The tasks were constructed based on the *generate* and *choose* portions of McGrath's (1984) task circumplex (as described in Straus, 1999) so as to (theoretically) foster varying degrees of

collaborative, cooperative, and interdependent activity. Representative tasks used in prior research that fell into these categories have included problem situations such as: decide the outcome of an ambiguous incident of academic misconduct; plan an event constrained by a number of competing interests; or generate and present a community outreach plan for your school or organization (Straus, 1999; Straus & McGrath, 1994; Zigurs, Poole, & DeSanctis, 1988).

Finally, the technologies or communication media were drawn from a set of capabilities that varied in terms of the number of modalities and synchronicity of interaction they support. In particular, media richness theory (Daft & Lengel, 1986; Daft et al, 1987) was used to select three media of supposedly descending richness: face to face, voice/teleconference (synchronous audio), and chat-type instant messaging (synchronous text). However, the *meanings* of those media, like the communicative context, were left to the experiences and interpretations of the media users themselves, thus accounting for the potential duality of communication technology in social contexts (Orlikowski & Robey, 1991).

Specifically, no medium was presupposed to be better suited than another based solely on the technical features or symbol carrying capability of the medium alone. Therefore, selection of any particular technological implementations for the voice conference and chat capabilities was arbitrary and based on convenience and availability rather than a pre-conceived notion of "better-or-worse." In fact, the aspects or features of a medium that are particularly relevant to the users were also presumed to be products of both subjective and social actions as well as an objective set of rules and resources the medium provides to mediate action. Again, it was the goal of this study to explore what those relevant aspects or features of the media capability were, rather than specify from the outset which ones would be of concern during the investigation. Therefore, the terms

media and *media capabilities* will be used interchangeably throughout the remainder of the report; however, the distinction of note is that the original intent was to focus on the capability of the medium as supported by technology, rather than the overt features or design aspects of the technologies themselves.

3. Symbolic Exchange of Influence Messages

Given the relative dearth of published studies that directly examined the effects of technology on the choice and use of specific influence messages, the present study limited the scope of inquiry concerning interpersonal influence to explicit verbal behaviors (messages) aimed at influencing others. Specifically, influence messages were herein conceptualized as discrete symbolic behaviors that fall into one of several *a priori* categories of influence message types. Those categories were developed based on the conceptual intersection of the Influence Behavior Questionnaire (IBQ), Profile of Organizational Influence Strategies (POIS), and the inventory of Political Influence Behaviors (all of which were discussed more fully in Chapter II above). The criterion for inclusion was that each influence message type or behavior appeared on at least two of the three inventories. The resulting list of seven influence messages contained at least 50 percent of the items from each respective inventory and included the following message types and behaviors: ingratiation, exchange, coalition tactics, pressure, rational persuasion, consultation and idea support, and upward appeals.

4. Overview of Research Framework

Consideration and integration of the three issues discussed above into a coherent research framework that would (theoretically) produce results addressing both research questions resulted in a fairly complex study design. Before proceeding to the particulars of the design and methods employed, a brief overview may help put the volume of

discussion and resultant data into proper perspective. The study was broken into three distinct phases, each one designed to address different elements of the research framework and different aspects of the research questions.

First, in order to determine how communication technology might affect various elements of the communicative context, those elements would have to be identified and described in relation to each other. However, it was also important that the particular elements to be examined were not completely idiosyncratic in their selection, but represented a set of prototypical issues and elements that were both common and relevant to a variety of small group experiences. Therefore, relatively large focus-groups were used generate and describe collective perceptions and experiences of small group communicative contexts and their constituent components.

Second, several small groups of individuals were given a chance to interact socially as well as use one of the three media capabilities for the purposes of sustained collaborative action and interaction within a structured environment. The nature of the structured environment supporting these interactions was designed to provide a reasonably complex and persistent communicative context that would confer at least some of the aforementioned benefits of studying small, bona fide groups. The purpose of structuring the environment at all was to better isolate, compare, and contrast potential media effects while keeping as many other aspects of the communicative context (between groups of media users) as uniform as possible. During those sustained interactions, the behavioral expression and incidence of the key influence messages was recorded for comparison between media user groups to directly address Research Question 1: how does communication technology affect or change the nature of symbolic, communicative behavior aimed at influencing others?

Finally, individual interviews with the members of the media user groups were conducted to provide an in-depth exploration of how the media capability (or technology) they used affected their perceptions and experiences of the communicative context within the structured environment. Additional insight was also sought during the interviews to determine how the media users experienced the notion of *influence* in their groups—behaviorally or otherwise—and the medium's or technology's role in those experiences. Results of these post hoc interviews directly addressed Research Question 2: how does communication technology affect or change the communicative context in which influence messages are produced and exchanged? Because of the variety and complexity of the methods, procedures, and manipulations used during the execution of this study, as well as the abundance of resultant data to be reported, individual methods and results chapters will be provided for each phase of the investigation.

Chapter III - Phase 1 Methodology, Defining the Communicative Context

A. METHODOLOGICAL NOTES AND BACKGROUND

Several elements of Northcutt and McCoy's (2004) Interactive Qualitative Analysis (IQA) technique were used throughout this study. IQA is a systems-centric approach to qualitative research. It seeks to capture the lived reality of individuals and their experiences, actively involving study participants in the mapping and depiction of their stories to fully explore a given phenomenon. Specifically, IQA elicits self-identified components, and relationships among components, of a particular issue or phenomenon. IQA integrates the identification of the nature of the problem with solutions, even if the researcher is not entirely certain what the problem is. At its core, IQA is designed to answer two fundamental questions about a given phenomenon: what are the components of a phenomenon as experienced by a relevant constituency, and how do the components relate to each other in a perceptual system (Northcutt & McCoy, 2004, p. 28)?

IQA provides a set of data collection and analysis protocols designed to minimize researcher bias. Participants themselves perform the first steps of analysis by organizing their discourse into categories of meaning called *affinities*; and the participants themselves take the analysis further by articulating their own perceived relationships of influence among the affinities. Thus, within the first phase of the study design, the phenomenon of interest to be defined is the communicative context in which influence messages are produced and exchanged. IQA procedures of data collection, abstraction, and representation were used to identify and then explore the nature of the most commonly understood or salient affinities associated with such a communicative context

and how those affinities interrelate (see Appendix A for a more thorough discussion of the IQA methodology).

The investigative techniques begin with a focus group (or groups) to generate collective "mindmaps" or system influence diagrams indicating the strength and precedence of the various factors comprising individual and group meanings and understandings of a given phenomenon. Larger focus groups (15 members or more) are desirable for a number of reasons related to the statistical analyses of the results; and also because there exists a tacit assumption that the larger the number of participants, the more likely the focus group is to produce an inclusive picture of all, or at least the most relevant, factors of a given phenomenon.

IQA focus groups are predominantly self-guided with the researcher functioning as a facilitator more than an interpreter or source of meaning. The focus groups begin with group members individually brainstorming about a given phenomenon, generating as many anecdotal or perceptual "data points" as possible and recording them on a series of note cards. All focus group members then engage in silent sorting and clustering of the cards into categories of similarity or meaning. The focus group then generates meaningful labels for the categories and identifies any sub-categories or sub-elements suggested by the meaning captured in the cards themselves. Finally, each focus group member casts a vote as to his or her perceptions regarding the nature of the relationship between every element or category of meaning identified in the previous step; for example, Category *A* influences Category *B*, *B* influences *A*, or no direct relationship between *A* and *B*. The votes are tallied and the results are depicted graphically in a preliminary mindmap that frames the remainder of the investigation (Northcutt & McCoy, 2004).

For example, assuming a focus group was asked to describe what it means to be part of a group project, a sample mindmap might look something like this:

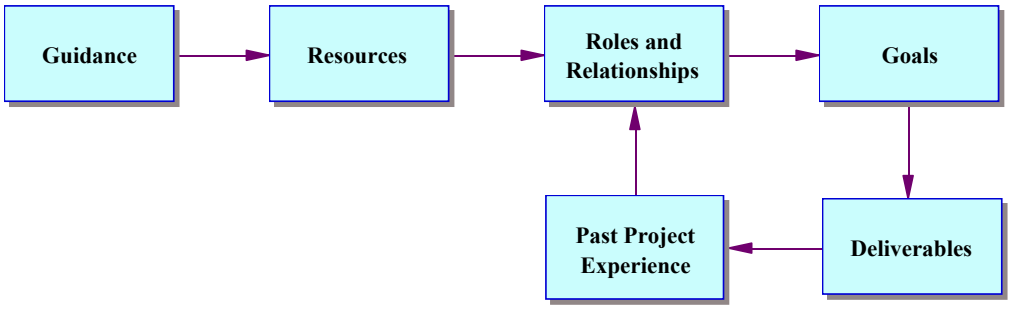


Figure 1. Sample IQA Focus Group Mindmap for a Group Project

In this simple example, the "driver" of the group project experience is the guidance provided regarding the project itself; this factor ultimately influences the perceptions and experiences of every other element in the system. For example, the quality of the guidance received might influence the kinds of resources sought or collected. The relative success with which those resources are located or utilized further influences a "feedback loop" of other elements. Within this loop, the roles and relationships of the group members impact the kinds of goals the group sets which themselves provide benchmarks for how closely or successfully the group is able to meet its deliverables. The ongoing progress, or success with which those deliverables are met, is weighed against the members' past group project experiences which are drawn upon to indicate whether adjustments to the group role structures and relationships are likely to be needed.

Such systems of representation may be linear, have branching paths, or recursive feedback loops like the one pictured above. The value of such a construction is that the resultant diagram is not only a representation of the common experience of a group project, it is in essence a *theory of experience* from which hypotheses and predictions can be drawn and tested. For example, given a set of initial conditions regarding guidance or

resources, one can predict what the outcome of the system might look like and weigh it against observational data. Working in reverse order, one could also deduce the initial or "upstream" conditions in order to account for the current state of the phenomenon. In the example above, assuming a group failed to complete its deliverables, the system allows one to postulate that part of the reason for that failure may have been that proper goals were not set ahead of time. Perhaps no group leader was chosen and therefore no one was responsible for ensuring the group set its goals accordingly. IQA-generated representations such as these help provide insight regarding where, when, or why certain sequences of events and experiences concerning a phenomenon turn positive and others negative.

However, the focus group merely establishes a collection of themes and elements that *could* be part of the more common perception of a particular phenomenon. In the example above, the focus group produced a representation of the relevant contextual features surrounding the common experience of a group project; yet, the final system did not necessarily have to include every element or theme identified during the note card sorting and clustering exercises. Instead, IQA specifies a Pareto protocol and power analysis procedure (see Appendix A, Part IV, Section E., for a more complete explanation) based on the group votes to determine whether an individual element or relationship between two elements should be included in the overall system depiction (Northcutt & McCoy, 2004).

The resultant system influence diagram is not arbitrary—it is not influenced by any idiosyncratic interpretation or inductive reasoning on the part of the researchers. Anyone employing the IQA Pareto protocol and power analysis techniques properly will produce the same system of representation. The Pareto protocol and power analysis tables are simply statistical tools used to maximize variance in group votes accounted for by the

relationships between system elements while minimizing the number of elements in the system itself (striving for parsimony in the resultant system). Therefore, the system produced by the focus groups' votes only includes the elements and relationships that statistically represent the ones perceived as *most* relevant to the collective experience of a group project.

B. FOCUS GROUP PARTICIPANTS AND RECRUITMENT

Given the amount of time they typically spend engaged in group work, and their availability to serve as study participants, a constituency of undergraduate and graduate students was solicited for participation in the focus group portion of the study. There was no theoretically compelling reason to believe that undergraduate and graduate experiences of small group projects differed in any fundamental way within a university setting; therefore, no attempts were made to limit participants based on academic standing. However, all participants were required to have experience working in small group settings on a common goal or project; whether that setting was professional or academic was not relevant to this phase of the study.

Recruitment was accomplished through subject pools, e-mail announcements, and word of mouth generated by instructors personally associated with the principle researcher across three different departments within a large southwestern university. Participants were paid for their time as well as a snowball sampling incentive for those who referred additional participants for the focus group. Scheduling was arranged such that each focus group had at least 15 members to ensure that no individual vote unduly influenced the final mindmap produced by the collective experiences and perceptions of all focus group members (Northcutt & McCoy, 2004).

Ultimately, enough interest was generated to convene two separate focus groups. A total of 39 individuals participated in the first phase of the study attending one of two

focus groups held 48 hours apart. Nineteen individuals attended the first group, 20 in the second. Nine participants were male and 30 were female though only one male attended the second group. Eleven participants were undergraduates; the rest were masters and Ph.D. students. Average age was just over 28 years.

C. FOCUS GROUP PROCEDURES

Each of the two focus groups lasted approximately 3 hours and was conducted in the same closed classroom setting to reduce distractions. All participants were provided markers and a stack of large note cards. Participants were guided through a short mental exercise to recall and focus on the circumstances and details surrounding a group project or projects in which they had participated. Focus group members were then instructed to engage in silent brainstorming and use the large note cards to write down phrases, perceptions, impressions, emotions or anything else that came to mind—one item per card. All cards were then taped to one of the four classroom walls. The focus group as a whole then publicly and iteratively clarified the meaning of any ambiguous cards so that everyone had roughly the same idea as to what each card meant.

After a 10 minute recess, the focus group members wandered around the room and engaged in silent grouping and sorting of the note cards into clusters of similar meaning. Ambiguous cards or groupings of cards were reconciled by consensus vote once the grouping activities appeared to be complete—roughly 30 minutes for each focus group. The focus group then discussed and negotiated an appropriate title for the categories of note cards; hereafter referred to as *affinities*. Each set of note-cards corresponding to each affinity was collected the focus group recessed for 15 minutes to allow enough time to print and reproduce voting sheets that would be used to identify relationships between affinities.

Upon reconvening, participants completed individual voting sheets (Affinity Relationship Tables; see Appendix A, Part III, Section D) that indicated the nature of the relationship (A influences B, B influences A, or no direct relationship) between all possible pairs of affinities the focus group had just produced. The voting form included a space to provide examples of the relationships giving respondents a chance to explain exactly how they had experienced that A influenced B, or vice versa. As each member of the focus group completed their form, they were paid and dismissed. Votes were subjected to the Pareto protocol and power analysis to develop a preliminary mindmap or system influence diagram for each focus group. The details of these procedures are described in greater detail in Appendix A, Part IV; however, a summary of the procedure will also be discussed in the next chapter of results.

D. AFFINITY RECONCILIATION PROCEDURES

Because more than one focus group was convened, reconciling affinities between the focus groups would provide a more unified and robust context of interpretation for the individual interviews conducted during Phase 3 of the study. Common elements of the affinities generated by both focus groups were therefore combined where possible through a series of four iterative reviews. These reviews were based on observations and suggestions from the principle researcher and inputs from two outside members of faculty familiar with IQA methodology, neither of whom had prior knowledge of the specific research objectives of this study. Results of the reconciliation process will be presented in the next chapter.

However, to develop a complete picture and appreciation for how the composite perceptions of the communicative context were related, it was also necessary to construct a new system influence diagram based on the reconciled affinities. The same voting forms and procedures used during the focus groups were used to provide the data

necessary to construct a new system. Specifically, a new affinity relationship table was produced allowing respondents to indicated the nature of the relationship (A influences B, B influences A, or no direct relationship) between all possible pairs of affinities. In this case, however, the definitions of the affinities used to create the new system were based on the reconciled results of both focus groups.

E. AFFINITY RECONCILIATION PARTICIPANTS AND RECRUITMENT

All members of both focus groups were contacted via e-mail and offered a small monetary incentive to complete another Affinity Relationship Table (ART) using the new affinity names and definitions. Fifteen of the original 39 participants completed and returned an ART. Three more tables were completed by graduate associates of the principle investigator; another 26 were filled out by graduate students attending a class on IQA methodology and administered by one of the authors of the IQA text book. The additional respondents were not informed as to the specific research objectives of this study, nor did they have any familiarity with the affinities beyond the definitions provided on the ART. Results of the reconciled Pareto protocol and power analysis will also be presented in the next chapter.

Chapter IV - Phase 1 Results, Defining the Communicative Context

The first focus group produced 368 unique note cards and 11 affinities for analysis; the second produced 309 cards and 12 affinities. Results of each group will be discussed in turn.

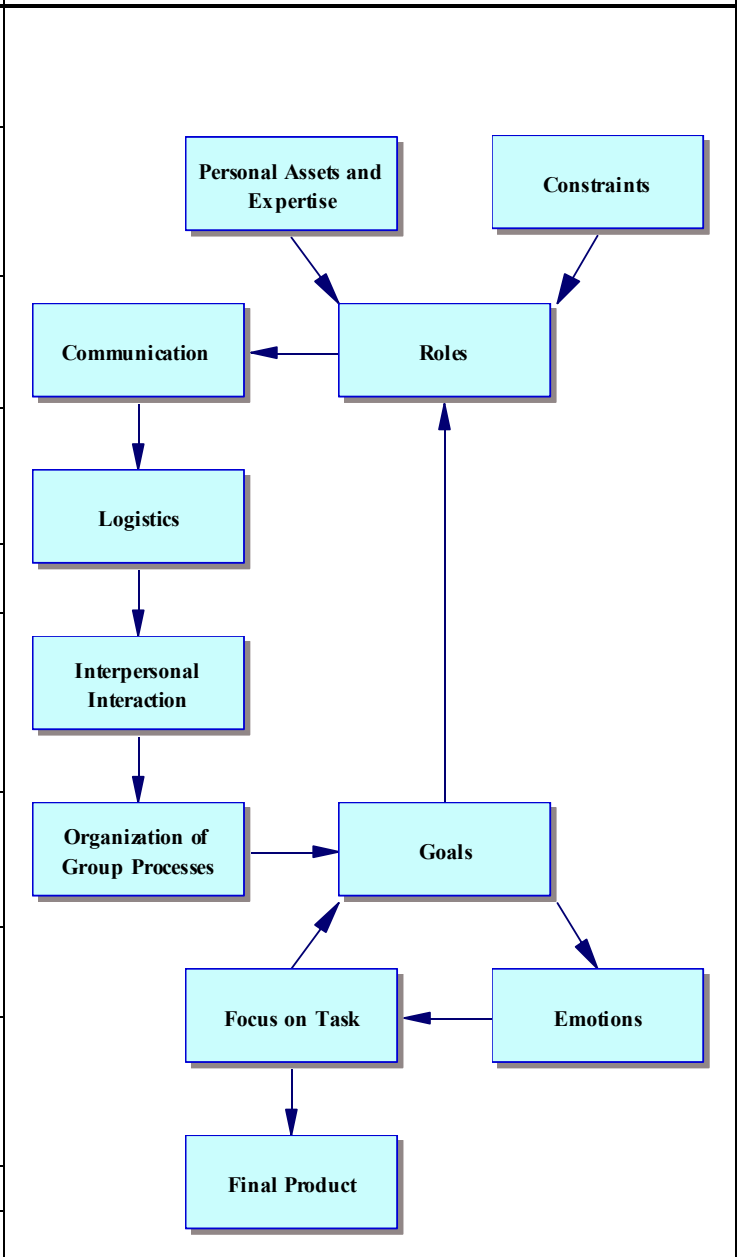
Focus Group 1: Affinities (concepts or themes) Relevant to Working in a Group/Group Project	Focus Group 1: System Influence Diagram – Representation of a Perceptual System of Relationships Between Affinities
Personal Assets/Expertise – using, sharing, and creating synergy from diversity of individual characteristics, competencies, skills, opinions, ideas, interpretations, and viewpoints	
Constraints – How group was formed: choose partners, assigned – Size: large vs. small groups, pref. for small groups – Performance Evaluation: grades, fairness/equity of the evaluation	
Roles – especially leadership and followership; issues of who will take initiative; determining who plays what role in group composition, what role will accomplish what part of work	
Communication – importance of communicating with others, overcoming communication barriers (language, different world views); using phone, e-mail, face-to-face channels	
Logistics – determining where to meet, how often, coordinating schedules, setting aside time to meet	
Interpersonal Interaction – byproducts of being near/working with other people - NEGATIVE: social loafing, others not living up to expectations, procrastinating, slacking - POSITIVE: teamwork, compromise, consideration of others, sense of identity/family/belongingness	
Organization of Group Processes – formalization of group workflow, keeping work and inputs organized, process to constantly get work done and find/fix errors; milestones to mark progress	
Goals – sharing same goal or vision, everyone having understanding of requirements and where group wants to go to meet them	
Emotions - POSITIVE: confidence, humorous, fun, motivated, fulfilled, satisfied, relief (especially at conclusion) - NEGATIVE: stress, overloaded, frustrated, nervous, anxiety, guilt, fear	
Focus on Task – sticking to the plan, focus on work	
Final Product – the deliverable of the project, how it's presented and formatted	

Table 3. Conceptual and Representational Results of Focus Group 1

Table 3 summarizes the results of the first focus group. Rather than detail the contents of every note card categorized under each affinity, only a distillation of the general meaning contained within those cards is presented on the left side of the table. A lengthier and more complete narrative definition of each affinity was not necessary as they would later be reconciled with the affinities produced during the second focus group.

Results indicate that the first focus group's participants expressed a variable but balanced outlook on their experiences and perceptions of group work. For example, many note cards expressed both positive and negative aspects of the *Interpersonal Interaction* and *Emotions* affinities. This suggested that those particular aspects of group work varied along a continuum of potential values between positive and negative valences or perceptions, and that the focus group participants had at least some experience associated with conditions at both ends of the spectrum.

Using votes from the individual Affinity Relationship Tables, the resulting system influence diagram (representing the most direct relationships between all affinities) is presented on the right side of Table 3. Based on this representation, the first focus group appeared to have a slightly deterministic perception of group work. For example, the *Personal Assets and Expertise* and *Constraints* affinities were outside "drivers" for the entire system; that is, what a person brings to the table as part of the group, and the constraints that define how the group was formed, ultimately influenced every other aspect of the interpersonal and work-related issues associated with the group project—including the success or failure of the group's *Final Product*. Furthermore, the fact that *Organization of Group Process*, *Goals*, and *Focus on Task* appear later in the system than issues such as *Communication* or *Interpersonal Interaction* suggests that this group perceived relational issues as having more downstream impact on the group's ultimate success or failure than how they actually got their work done.

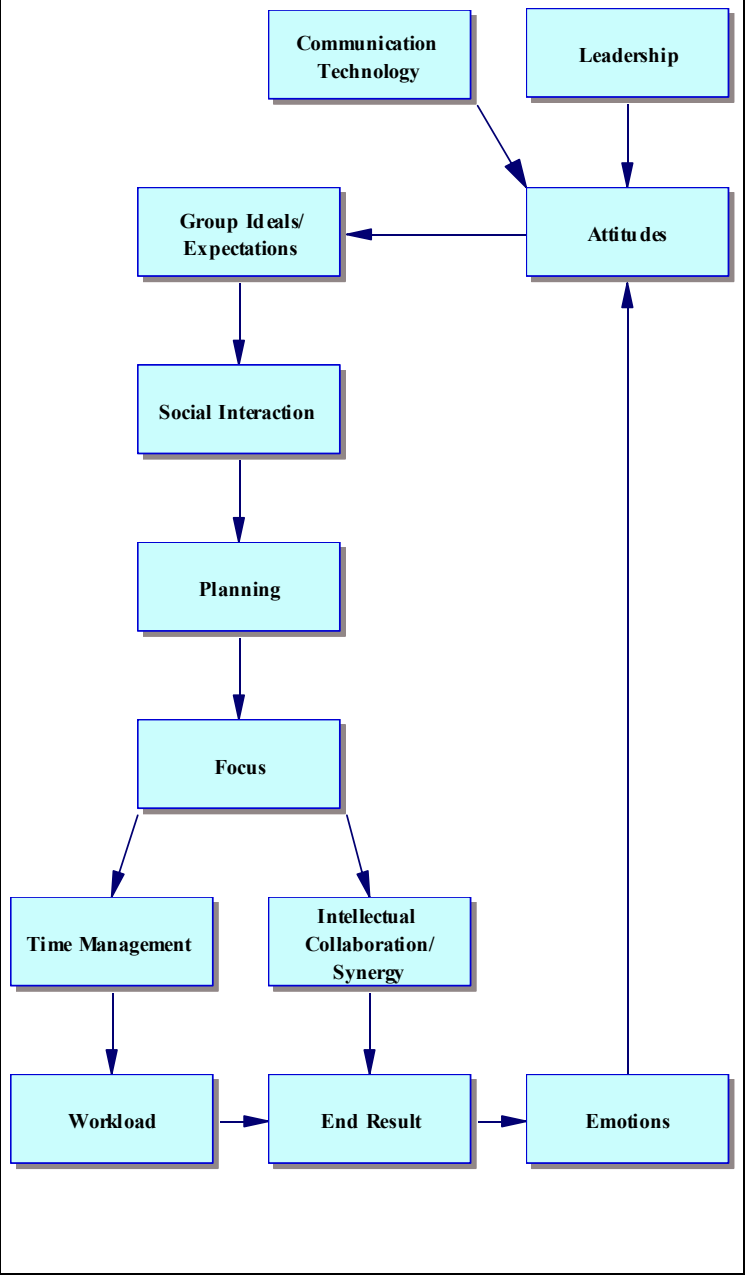
Focus Group 2: Affinities (concepts or themes) Relevant to Working in a Group/Group Project	Focus Group 2: System Influence Diagram - Representation of a Perceptual System of Relationships Between Affinities
Leadership – ambition, charisma, driving force, taking responsibility; concerns about the need for a leader to guide group	
Communication Technology – using technology to bridge schedules as well as "workspace" to complete or coordinate tasks; conduit; used instead of face-to-face communication	
Attitudes (towards others and the task) - NEGATIVE: questioning commitment, ability or dependability of others (i.e. idiots, slackers); lack of interest, willingness or motivation for task itself	
Group Ideals/Expectations about Group Work – social norms and expectations about working in groups, i.e. patience, cooperation, professionalism, respect, willingness to participate, giving full effort, providing constructive criticism	
Emotions – NEGATIVE: stress, fear, anxiety, worry, low self-esteem, confusion, frustration, discouragement, resentment, disappointment	
Social Interaction – byproducts of simply working in a group with other people - NEGATIVE: conflict, arguing, & disagreements; power/control issues, sexism, ego issues, rudeness - POSITIVE: networking, bonding, friendships, belonging, camaraderie, companionship, support	
Workload – concerns about equity in division of labor; process of deciding how to assign/delegate pieces of project or pooling appropriate resources including roles of individual group members	
Time Management – balancing work and other time demands once project is underway; meeting deadlines/putting in overtime as deadlines near	
Focus On Task – staying on track, keeping on the appropriate topics, avoiding digressions	
Planning – setting common goals; outlining a workflow, prioritization, and timeline of deliverables at the outset	
Intellectual Collaboration/Synergy – using and sharing diversity of individual skills, knowledge, insight and experience to create something greater than the sum of its parts or individual contributions	
End Result – the final product of the project as well as its evaluation (grades) or rewards (line on resume, sense of accomplishment), relief/pride at completed project	

Table 4. Conceptual and Representational Results of Focus Group 2

The second focus group's perceptions and experiences of group work (Table 4) were less balanced than those of the first focus group, best evidenced by the singularly negative tone of the *Emotions* and *Attitudes* affinities. Furthermore, the second focus group's perceptual system was more cyclical, allowing for greater feedback and downstream adjustments to the perceptions of upstream issues or factors affecting the ongoing experience. For example, *Communication Technology* and *Leadership* were perceived as driving factors upon which the remainder of the experience was built; the *End Result* affinity was a downstream or "outcome" issue—similar to the sentiments and relationships expressed during the first focus group. However, the connection between the *End Result* and *Emotions* affinities suggested that individual feelings about the end result, or the circumstances surrounding its ongoing success or failure, might feed back into one's emotional states. Such feedback could, in turn, further affect one's *Attitudes* about the task and other group members, ultimately influencing how well the group contends with interpersonal or work-related issues, and so on as the group progressed through the system.

A. RECONCILING AFFINITIES

Initial review of both systems and affinity content suggested a number of similarities in perception and experience of group work. Results of the reconciliation process are presented on a per-affinity basis in the following series of tabular comparisons between the two focus groups. Notes have been added to clarify the rationale for certain combinations of ambiguous, overlapping, or multiple affinity definitions.

1. Communication

Focus Group 1: Communication	Focus Group 2: Communication Technology
Importance of communicating with others, overcoming communication barriers (language, different world views); using phone, e-mail, face-to-face channels	Using technology to bridge schedules as well as a workspace to complete or coordinate tasks; communication conduit; used instead of face-to-face communication
Reconciled Affinity: Communication	
The means, methods or technologies used to communicate between group members (i.e. face-to-face, telephone, e-mail, Blackboard, etc.), as well as the importance of using those channels to conduct and coordinate activities and keeping those channels open between group members.	

Table 5. Reconciled Communication Affinity

2. Emotions

Focus Group 1: Emotions	Focus Group 2: Emotions
- POSITIVE: confidence, humorous, fun, motivated, fulfilled, satisfied, relief (especially at conclusion) - NEGATIVE: stress, overloaded, frustrated, nervous, anxiety, guilt, fear	NEGATIVE: stress, fear, anxiety, worry, low self-esteem, confusion, frustration, discouragement, resentment, disappointment
Reconciled Affinity: Emotions	
- POSITIVE: confidence, humorous, fun, motivated, fulfilled, satisfied, relief (especially at conclusion) - NEGATIVE: stress, overload, frustration, anxiety, guilt, fear, worry, low self-esteem, confusion, discouragement, resentment, disappointment	

Table 6. Reconciled Emotions Affinity

3. Final Product/Resolution

Focus Group 1: Final Product	Focus Group 2: End Result
The actual deliverable of the project including concerns for how it is presented or formatted	The final product of the project
Reconciled Affinity: Final Product/Resolution	
The resolution of the group project itself, i.e. the deliverable of the project or end result of the group's efforts	

Table 7. Reconciled Final Product/Resolution Affinity

4. Group Establishment and Formation

Focus Group 1: Constraints	
How group was formed: choose partners, assigned – Size: large vs. small groups, pref. for small groups	
Reconciled Affinity: Group Establishment/Formation	
Issues relating to the circumstances surrounding the formation or establishment of the group itself – How group was formed: choose partners, assigned – Size: working with large vs. small groups, preferences for one over other	

Table 8. Reconciled Group Establishment/Formation Affinity

The second focus group did not discuss matters of how the group itself might be formed, how group members were chosen, or the group's size. However, the label *Constraints* could be interpreted to include how performance might be measured; linking *this* notion of constraints to a group's output rather than *a priori* conditions of its formation or membership. The affinity was relabeled *Group Establishment/Formation* to help mitigate such potential for confusion.

5. Group Roles

Focus Group 1: Roles	**Focus Group 2: Leadership**
Especially leadership and followership; issues of who will take initiative; determining who plays what role in group composition, what role will accomplish what part of work	Ambition, charisma, driving force, taking responsibility; concerns about the need for a leader to guide group
	Focus Group 2: Workload
	process of deciding how to assign or delegate pieces of the project or pooling appropriate resources *including roles of individual group members*
Reconciled Affinity: Group Roles	
Deciding who will be the group's leader(s) to provide the driving force, take responsibility, or guide the group's activities. Also what roles other members will play and how those roles are decided.	

Table 9. Reconciled Group Roles Affinity

The conceptual foundations of the first group's *Roles* affinity seemed split between the second group's notions of *Leadership* and aspects of *Workload* that dealt

with apportioning the group's work to different individuals based on their roles. Because leadership is a type of group role, and both *Leadership* and *Roles* appeared at or near the very near the front of their respective system influence diagrams, it seemed unnecessary to separate these concepts for further analysis.

6. Incentives/Motivation

Focus Group 1: Constraints	**Focus Group 2: End Result**
– Performance Evaluation: grades, how will they be determined, reflect on participation, whether grades are motivation enough for required effort	Evaluation (grades) or rewards (line on resume, sense of accomplishment), relief or pride at completed project, whether others care about the grade
Reconciled Affinity: Incentives/Motivation	
Rewards (tangible or intangible) received from participating in or completing the group project, whether such rewards provide motivation for individual and group effort, and the equity with which those rewards are distributed throughout the group	

Table 10. Reconciled Incentives/Motivation Affinity

The first focus group's notion of *Constraints* included an evaluative component dealing with both how grades would be determined *a priori*, the actual grades received at the end of a project, and whether those grades were equitably distributed based on effort. The second focus group's *End Result* affinity also addressed grades, but it included other extrinsic motivators as well as intangible rewards for effort such as pride or a sense of accomplishment. The second focus group also gave mention to whether the rewards, grades in particular, were motivating to members of the group. Therefore, the evaluative and motivational components of each of these affinities were combined into a separate *Incentives/Motivation* affinity that captured both the extrinsic and intrinsic factors that might provide incentives for individual and group effort.

7. Logistics

Focus Group 1: Logistics	**Focus Group 2: Time Management**
Determining where to meet, how often, coordinating schedules, setting aside time to meet w/group	Balancing work w/other time demands once project is underway; meeting deadlines or putting in overtime as deadlines draw near
Focus Group 1: Goals	**Focus Group 2: Planning**
Sharing same goal or vision; everyone having understanding of requirements (who needs to do what) and where the group wants to go	Setting common goals, Outlining a workflow, prioritization, and timeline of deliverables at the outset
Focus Group 1: Organization of Group Processes	**Focus Group 2: Workload**
Formalization of group workflow, keeping work and inputs organized, process to constantly get work done and find/fix errors, milestones to mark progress	Process of deciding how to assign or delegate pieces of the project or pooling appropriate resources
Reconciled Affinity: Logistics	
End-to-end management of the group and project lifecycle including: - setting/sharing common goals or understanding of vision - planning when, where, and how often the group meets - balancing competing demands (leisure, sleep, other classes and projects, etc.) to devote to the project - processes or evaluations to keep the project moving, on track, and meeting deadlines (milestones, organizational and workflow schemes, quality checks and reviews)	

Table 11. Reconciled Logistics Affinity

All of the affinities, or portions of affinities, identified above centered on how work was actually accomplished from start to finish within the group context. This suggested that a single conceptual label might be appropriate to describe such movement of work or workflow within the group. Hence, the term *Logistics* was chosen as the affinity name and its definition expanded beyond that used by the first focus group to become the more all encompassing metaphor of the many details associated with group work or group projects. The full *Logistics* affinity includes not only *a priori* considerations such as setting schedules or dealing with deadlines, but also on-going, project management-like issues such as time and resource management, physical logistics

and considerations of group meetings, balancing the competing demands of the group members, and progress checks or self-evaluations to keep the group's work moving.

8. Relationships

<table>
<tr><th>Focus Group 1: Interpersonal Interaction</th><th>Focus Group 2: Social Interaction</th></tr>
<tr><td rowspan="3">Byproducts of being near/working with other people
- POSITIVE: compromise, consideration of others, sense of identity, family, or belonging</td><td>Byproducts of working in a group with other people
- NEGATIVE: conflict, arguing, & disagreements; power/control issues, sexism, ego issues, rudeness
- POSITIVE: networking, bonding, friendships, belonging, camaraderie, companionship, support</td></tr>
<tr><td>Focus Group 2: Group Ideals/Expectations about Group Work</td></tr>
<tr><td>Social norms and expectations about working in groups such as patience, respect, professionalism, providing constructive criticism</td></tr>
<tr><td colspan="2">Reconciled Affinity: Relationships</td></tr>
<tr><td colspan="2">Relational and interpersonal issues associated with being around other people:
- POSTIVE: compromise, respect, networking, belonging, support, professionalism, identity
- NEGATIVE: conflict and argument, struggles for power and control, ego issues</td></tr>
</table>

Table 12. Reconciled Relationships Affinity

This affinity was difficult to disentangle from *Teamwork* due to the large degree of conceptual overlap in the data points comprising each cluster of meaning the focus groups produced. However, both groups expressed concern over interpersonal matters—how people related to each other within a social setting—that seemed distinct from the ways people might work together in those settings. Pilot interviews also suggested that while these concepts were tightly coupled, the distinction between them was strong enough to warrant their separation; additional commentary is provided below under the *Teamwork* affinity.

9. Synergy

Focus Group 1: Personal Assets/Expertise	Focus Group 2: Intellectual Collaboration/ Synergy
Using, sharing, and creating synergy from diversity of individual characteristics, competencies, skills, opinions, ideas, interpretations, and viewpoints	Using and sharing a diversity of individual skills, knowledge, insight, and experience to create something greater than the sum of its parts or individual contributions
Reconciled Affinity: Synergy	
Primarily an intellectual or resource-based outcome based on the sharing of a diversity of individual skills, experience, knowledge, ideas, and interpretations to create something better than could be accomplished alone.	

Table 13. Reconciled Synergy Affinity

10. Task Focus

Focus Group 1: Focus on Task	Focus Group 2: Focus on Task
Sticking to plan, focusing on work	Staying on track, keeping on the appropriate topics, avoiding digressions
Reconciled Affinity: Task Focus	
Staying on track, mentally focusing on the work, keeping on the appropriate topics, avoiding digressions.	

Table 14. Reconciled Task Focus Affinity

11. Teamwork

Focus Group 1: Interpersonal Interaction	Focus Group 2: Group Ideals and Expectations about Group Work
- NEGATIVE: social loafing, others not living up to expectations, procrastinating, slacking - POSITIVE: teamwork	Willingness to participate, giving full effort, cooperation
	Focus Group 2: Attitudes towards others and the task
	NEGATIVE: questioning commitment, ability or dependability of others (i.e. idiots and slackers); lack of interest, willingness or motivation for task itself
	Focus Group 2: Workload
	Concerns about equity in division of labor
Reconciled Affinity: Teamwork	
- POSITIVE: teamwork, cooperation, equity of effort - NEGATIVE: slacking, social loafing, inequities in work/effort	

Table 15. Reconciled Teamwork Affinity

As mentioned previously with *Relationships*, *Teamwork* was one of the more difficult affinities to resolve given the number of conceptually similar or overlapping exemplars and data points produced between the two focus groups. Indeed, both focus groups developed similarly themed affinities, or incorporated similarly themed issues within the definitions of other affinities, that centered on being in groups with others and the conduct of working in groups with others. The positive and negative valences associated with relational issues inherent in any type of social interaction were incorporated into the *Relationships* affinity defined previously. However, other relational issues which were common between focus groups spoke to specific virtues or social expectations about group work such as cooperation, working together, and everyone pulling their own weight. In fact, both groups indicated common experiences and perceptions regarding the negative aspects or consequences of ignoring those virtues, including slacking and social loafing, both of which were highly charged topics for both focus groups.

Given these experiences and perceptions, it seemed clear that if *Teamwork* and *Relationships* were indeed separate affinities, the two were tightly coupled. However, it was conceivable—based on the focus group's discussions and pilot interviews—that one might enjoy positive interpersonal relationships but not the kind of teamwork necessary to produce positive work-related outcomes. Similarly, a group might experience effective or efficient working conditions without enjoying similarly positive interpersonal exchanges between members. Therefore, it seemed reasonable to advance *Teamwork* as a conceptually distinct affinity.

B. CONSTRUCTING THE COMPOSITE INVESTIGATIVE FRAMEWORK/COMMUNICATIVE CONTEXT

Using the 11 composite affinity definitions and the results of another Pareto protocol, a new system influence diagram would be created so that the relationships between composite affinities could guide subsequent inquiry during Phase 3 of the study. In all, 44 ARTs were returned producing 2,215 individual affinity pair votes, enough to provide the foundation for a very robust system (Northcutt & McCoy, 2004). Complete results of the Pareto protocol are included in Appendix B; a power analysis table excerpt appears below.

Affinity Pair Relationship				Frequency Sorted (Descending)	Cumulative Frequency	Cumulative Percent (Relation)	Cumulative Percent (Frequency)	Power
1.	1	→	3	43	43	0.9	1.9	1.0
2.	3	←	6	41	84	1.8	3.8	2.0
3.	3	←	7	41	125	2.7	5.6	2.9
4.	3	←	11	40	165	3.6	7.4	3.8
5.	5	→	10	40	205	4.5	9.3	4.7
6.	3	←	5	38	243	5.5	11.0	5.5
7.	4	→	11	38	281	6.4	12.7	6.3
8.	3	←	9	38	319	7.3	14.4	7.1
9.	6	→	11	38	357	8.2	16.1	7.9
10.	8	→	9	38	395	9.1	17.8	8.7
11.	3	←	10	37	432	10.0	19.5	9.5
12.	1	→	9	37	469	10.9	21.2	10.3
13.	5	→	11	36	505	11.8	22.8	11.0
14.	4	→	9	36	541	12.7	24.4	11.7
15.	2	→	3	35	576	13.6	26.0	12.4
16.	8	→	11	35	611	14.5	27.6	13.0
17.	1	→	11	35	646	15.5	29.2	13.7
18.	3	←	8	35	681	16.4	30.7	14.4
19.	4	→	10	35	716	17.3	32.3	15.1
20.	4	→	5	34	750	18.2	33.9	15.7
21.	3	←	4	34	784	19.1	35.4	16.3
22.	6	→	10	34	818	20.0	36.9	16.9
23.	5	→	9	34	852	20.9	38.5	17.6
24.	2	→	10	33	885	21.8	40.0	18.1
25.	8	→	10	33	918	22.7	41.4	18.7
26.	2	→	9	32	950	23.6	42.9	19.3
27.	7	→	9	32	982	24.5	44.3	19.8
28.	1	→	10	31	1013	25.5	45.7	20.3
29.	6	→	9	31	1044	26.4	47.1	20.8

30.	1	→	7	30	1074	27.3	48.5	21.2
31.	9	←	11	30	1104	28.2	49.8	21.7
32.	2	←	6	30	1134	29.1	51.2	22.1
33.	4	→	7	28	1162	30.0	52.5	22.5
34.	5	→	7	28	1190	30.9	53.7	22.8
35.	7	→	11	28	1218	31.8	55.0	23.2
36.	10	←	11	27	1245	32.7	56.2	23.5
37.	2	←	4	27	1272	33.6	57.4	23.8
38.	2	→	11	26	1298	34.5	58.6	24.1
39.	4	→	8	26	1324	35.5	59.8	24.3
40.	1	←	8	25	1349	36.4	60.9	24.5
41.	1	←	6	25	1374	37.3	62.0	24.8
42.	2	←	5	25	1399	38.2	63.2	25.0
43.	5	→	6	24	1423	39.1	64.2	25.2
44.	7	→	10	24	1447	40.0	65.3	25.3
45.	2	→	8	23	1470	40.9	66.4	25.5
46.	1	→	2	23	1493	41.8	67.4	25.6
47.	2	←	7	23	1516	42.7	68.4	25.7
48.	1	→	5	22	1538	43.6	69.4	25.8
49.	5	→	8	22	1560	44.5	70.4	25.9
50.	9	→	10	21	1581	45.5	71.4	25.9
51.	5	←	8	21	1602	46.4	72.3	26.0
52.	1	←	4	21	1623	47.3	73.3	26.0
53.	1	←	5	21	1644	48.2	74.2	26.0
54.	1	←	2	20	1664	49.1	75.1	26.0
55.	7	←	8	20	1684	50.0	76.0	26.0
56.	9	←	10	20	1704	50.9	76.9	26.0
57.	2	←	8	20	1724	51.8	77.8	26.0
58.	6	→	8	20	1744	52.7	78.7	26.0
59.	6	→	7	19	1763	53.6	79.6	26.0
60.	1	→	8	18	1781	54.5	80.4	25.9
61.	6	←	8	17	1798	55.5	81.2	25.7
62.	4	←	6	17	1815	56.4	81.9	25.6

Table 16. Power Analysis Table from Reconciled Affinity Pareto Protocol

Each row of the affinity pair relationship column represents one pairing of the eleven composite affinities; the arrow between them indicates the perceived direction of causality or influence between the two. Each relationship appears in descending order of frequency votes from all 44 ARTs. The cumulative frequency represents the total number of votes from all respondents accounted for by the additional votes of each new affinity pair; cumulative percent (relation) indicates the cumulative proportion of the 110 total

affinity pairs accounted for by each new affinity pair. The cumulative percent (frequency) is the cumulative percentage of the total 2215 votes accounted for by the votes associated each additional affinity pair. Finally, power indicates the difference between the percentage of cumulative votes accounted for by each affinity pair and the percentage of cumulative relationships accounted for by each affinity pair.

The cutoff (highlighted in Table 16) for all relationships to be included in the composite system was determined using the MinMax criterion (Northcutt & McCoy, 2004). Specifically, a cut-off was selected to optimize the trade-off between accounting for maximum variability (cumulative percent by frequency) and minimizing the number of relationships for the sake of parsimony (cumulative percent by relation). In general, IQA systems modeling requires that the selected affinity pair relationships account for at least 80 percent of the total variance, often at or slightly after the point where marginal gains in power begin to decline.

The obtained power analysis table indicates the first 60 affinity pair relationships accounted for 80.4 percent of the total variance. Another two relationships were selected so that at least one variant of every possible affinity pairing (A $\rightarrow$ B or A $\leftarrow$ B) was considered for the final system. In all, 62 relationships—56.4 percent of the total possible relationships accounting for 81.9 percent of the total variance in votes from the ARTs—were used. These figures include 12 conflicts which would have to be reconciled in the final system. A conflict occurs when both A $\rightarrow$ B and A $\leftarrow$ B relationships appear above the cutoff, indicating that despite the ambiguity of thought the conflict represents, incorporating both relationships into the model would still account for a significant portion of additional variance and marginal gain in explanatory power.

The intermediate steps and data reduction procedures required to convert the tabular votes from the ARTs and Pareto protocol into a graphical representation of a

perceptual system are not critical to the results reporting at this time (though they are presented in Appendix B for the sake of methodological transparency). However, it is once again important to note that the resulting system of representation is not an arbitrary construction; proper application of the Pareto protocol and power analysis procedures will *always* produce the same physical system given the same set of voting results. Figure 2 is a "cluttered" system influence diagram; it represents all the affinity pair relationships that appear above the MinMax criterion, but has not yet been simplified to remove redundant connections between affinities. In essence, the cluttered system can be conceptualized as a "graphical short hand" for all the data presented in Table 16.

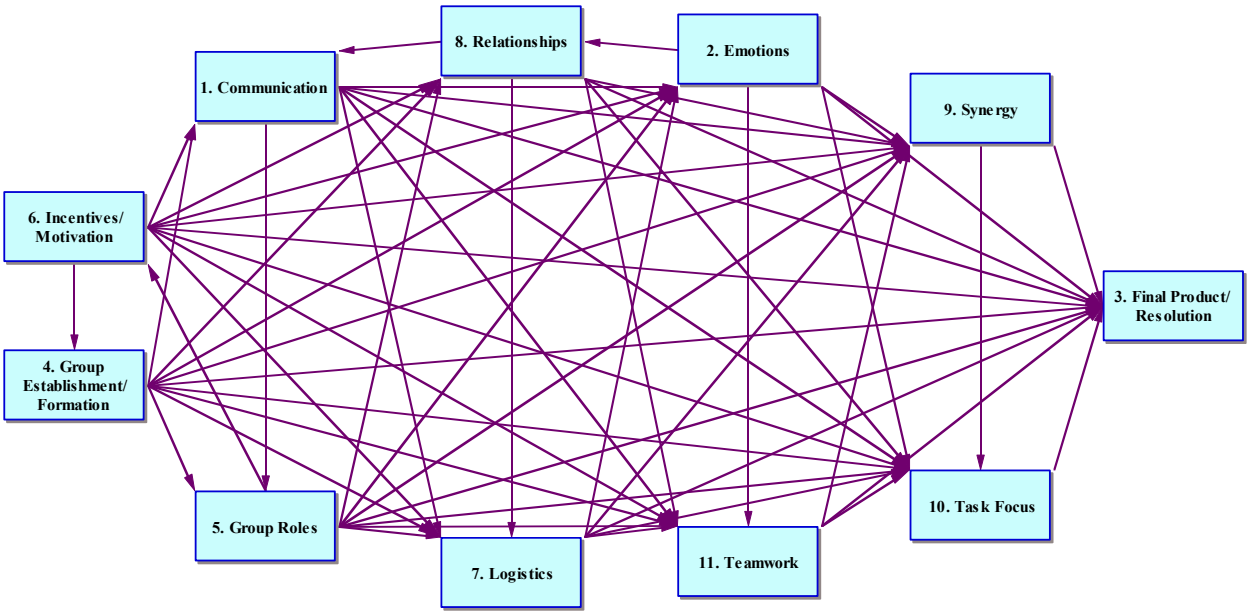


Figure 2. Cluttered System Influence Diagram

Using the cluttered System Influence Diagram as a starting point, all redundant links between affinities were systematically removed or simplified through a pre-determined *rationalization* process (described in Appendix A, Part III, Section G.). Once the system was reduced to its simplest or *uncluttered* form in which all redundancies

were removed, conflicting relationships that survived the MinMax criterion from the Pareto protocol were added back into the system (Figure 3) and subjected to a second rationalization procedure.

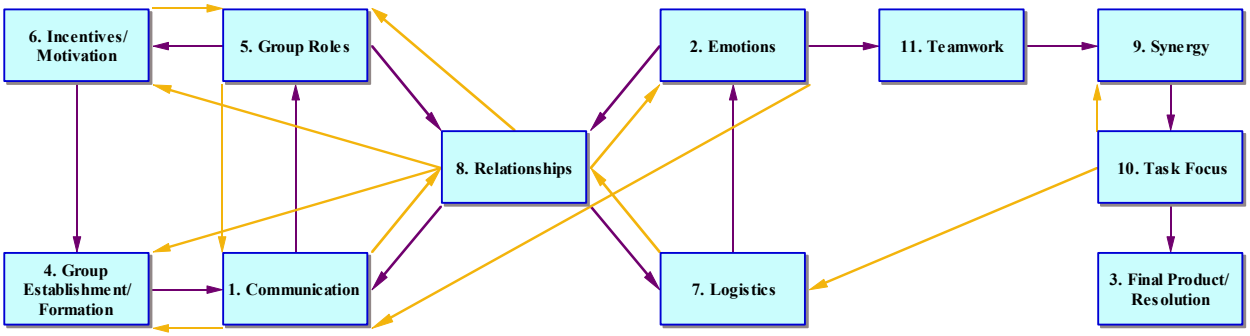


Figure 3. Uncluttered System Influence Diagram Including Conflicts (Orange Links)

The final system, pictured in Figure 4, is the simplest representation of all the affinity pair relationships and conflicts above the MinMax criterion as tallied from the votes cast in the Affinity Relationship Tables. Each iteration of these rationalization processes were also checked for accuracy with one of the authors of the IQA textbook to help ensure reliability in the execution of the various protocols and procedures and in the depiction of the resultant system.

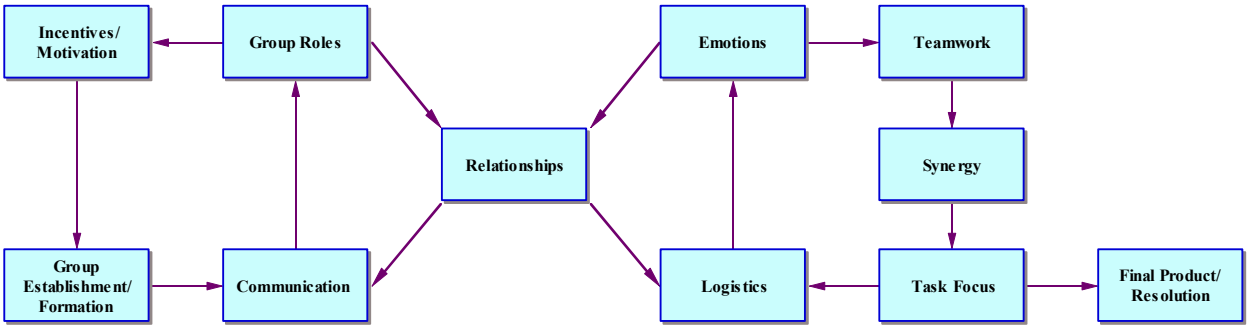


Figure 4. Pareto-Reconciled Uncluttered System Influence Diagram

Using this final composite system influence diagram as a template for the common understanding or experience of working in a group, an interview protocol was developed for Phase 3 of the study that would examine perceptions of the structured group experiences from the perspective of each of the 11 affinities specified above, and in priority order as they appeared within the system. The protocol would not only help standardize the interview for all participants in the study, it would provide an organizing principle for their responses along the potential flow of perceptions or activities that would (presumably) occur within the study once the participants began their group work.

For example, the system layout suggests that it would not be logical to begin an interview examining issues such as *synergy* or *teamwork* if upstream issues that drive the entire system, such as *relationships*, *incentives and motivation*, or *communication*, were not first considered or at least discussed. The principle researcher's prior IQA experience has also demonstrated that the further an IQA interview moves towards the outcome end of the system, the more likely people are to talk about those outcomes in terms of the drivers or inputs that affect them—and the less they have to say about those drivers if the interview returns to them at a later point. Therefore, it has proven prudent to follow the flow of thought and experience through a perceptual system from drivers to outcomes so that the individual interviews provide as much detail and richness as possible about all aspects of the system.

Due to the present focus on the notion of influence, an *Influence* affinity was also added to the interview protocol to examine how study participants experienced or perceived influence during the structured group experiences. However, influence per se would not be modeled in the system influence diagram nor would it be fully crossed with the other system affinities during the theoretical coding (the perceived relationships

between all affinities) portion of the individual interviews. The complete interview protocol is attached at Appendix C.

Based on the results reported above, the interpretive framework for the communicative context was now defined. Specifically, the composite affinities described the most relevant or salient aspects of the communicative context (for this constituency) responsible for perceptions and experiences of group work. These affinities would be the focus of analysis to indicate how different media and technologies might affect these specific elements of the communicative context in which group work was accomplished and influence was (presumably) expressed. Relationships between affinities, as depicted in the composite system influence diagram, further describe the precedence of those affinities within the perceptual system, and thus indicated the relative order in which the affinities should be analyzed.

Chapter V - Phase 2 Methodology, Structured Group Experiences

Phase 2 of the study involved the structured experiences in which small groups would meet, interact, and complete a collaborative task within their own communicative context using one of the media capabilities of interest. These experiences were administered using an experimental protocol to make them as homogenous as possible between groups of media users. How participants perceived and reacted to elements of their experience, and how the varying media might have figured in to those perceptions and reactions, were the subjects of follow-up interviews during Phase 3. However, the experimental protocol framed a behavioral, rather than perceptual, measure of influence, thus providing insight into the first research question.

A. VARIABLES AND DESIGN

1. Independent Variable

Medium: operationalized at three levels corresponding to three communication media capabilities; face-to-face, synchronous audio (voice conference), and synchronous text (chat).

2. Dependent Variable

Incidence of influence messages: a measure of the number of verbal or written communicative acts that corresponded to the seven key influence messages; rational persuasion, consultation/idea support, ingratiation, exchange, coalition tactics, pressure, and upward appeals.

3. Design

A split-plot repeated measures design was used to examine the effects of various media on the incidence of influence messages. This hybrid design combined the benefits

of reducing within-subject variance through repeated measurement with economy of effort because a fully crossed factorial or counterbalanced combination of participants and variables was not required to detect main effects and interactions over time. For example, a single participant group did not have to be assigned to all three media conditions or a single participant to different groups using different media to facilitate meaningful comparisons between differences in dependent measures.

The longitudinal group settings spanned three separate meetings over three consecutive days and were used to create a persistent and theoretically more complex communicative context that might better facilitate examination of the various contextual and perceptual issues addressed in Phases 1 and 3 of the study. Each group meeting consisted of both task-related and socially oriented encounters—opportunities for social interaction were provided in accordance with the procedures outlined in Section D. To mitigate the potential for practice effects and fatigue, a qualitatively different task was administered on each of the consecutive meeting days.

B. TASKS

Interactions between task type and media have been demonstrated to affect coordination and interdependence (Straus & McGrath, 1994). However, task type per se was not manipulated or controlled for the sake of the research objectives in this study. Instead, tasks were drawn from the *generate* and *choose* segments of the task circumplex; first, to give participants something different to do each time they met; second, to produce *any* sense or need for group coordination and interdependence at all—at least enough to reasonably expect some expression of influence messaging behaviors to occur.

One task involved a scenario in which the participants were stranded in the desert after a plane crash; the pilot and copilot were killed before a distress signal could be sent and the participants had to rank order 11 different items necessary for survival. The task

is a group-building and problem-framing exercise (was the emphasis on survival or rescue?) common in professional and management circles because it requires individual creativity as well as collective planning, judgment, and evaluation. A number of consensus-based decisions, such as planned use for each item and the rationale for the items' precedence on the list, were also added to the rank-ordering exercise to further facilitate member coordination and interdependence.

The remaining two tasks appeared in Straus and McGrath (1994) and Straus (1999) and were adapted with the authors' permission. One task required the group to generate ideas that would improve the quality of the physical environment at their university or surrounding metro area. Participants were to generate as many ideas as possible; decide as a group which would be implemented and describe why; then develop a list of resources or requirements needed to implement the chosen idea. The other task asked participants to decide on disciplinary actions for a fictitious case in which a college basketball player bribed an instructor to change his grade on an exam to maintain athletic eligibility. Groups had to reach a consensus on a course of action drawn from a list of alternatives for each of five issues concerning the treatment of the athlete and instructor. Groups also had to satisfy conflicting interests of the faculty, administration, and athletic department when making their decisions (all task materials are provided in Appendix C).

C. PARTICIPANTS AND RECRUITMENT

In order for the reconciled system influence diagram (developed during Phase 1) to be useful and informative for the remainder of the study, participants for Phases 2 and 3 of the study must be part of the same constituency as the focus group. However, to mitigate the risks of priming study participants to the relevant aspects of the communicative context, no focus group members were permitted to participate in the structured group experiences. Participants also had to be physically capable of

communicating through all three subject media such as being able to type or hear conversation-level voices through a speaker phone.

Recruitment was accomplished through e-mail announcements and word-of-mouth generated within the classes of several instructors associated with the principle researcher. Follow-up e-mail announcements were also sent to those individuals who originally volunteered for the focus groups but were unable to attend due to scheduling issues. All participants were provided graduated monetary compensation for their time with complete payout given to those who completed Phases 2 and 3 of the study.

Volunteers were first grouped based on common availability until groupings of at least four individuals were formed that could meet for three consecutive days. Four participants per group were then randomly selected from all the available openings and from time slots where more than four people volunteered to participate. Random assignment without replacement was used to assign each group of four to one of the three media conditions. In all, six groups totaling 24 individuals were administered using an experimental protocol, two groups for each of the three media conditions, constituting a complete replication of the basic study design.

Sixteen participants were female, eight were male; average age was 25. Forty-two percent of the participants were undergraduates, 46 percent were graduate students, and 8 percent were professionals who had completed graduate degrees within the past year. Programs of study ranged across a variety of disciplines including communications, business, engineering, physics, information studies, and art history. Each of the six groups consisted of four individuals during the first of the three task sessions; however, one individual in second voice conference group quit during the second day of the study leaving 23 participants for the remainder of the task meetings and follow-on interviews.

One group was also replaced entirely when two of the four participants failed to arrive on the second day.

D. MATERIALS AND PROCEDURES

Administration for the group meetings occurred in four 8 x 8 foot enclosed study rooms arranged in a row along the edge of a single hallway. Each room was heavily insulated and fitted with privacy windows and doors so that participants working in separate rooms could not see or hear each other. Each room contained a rectangular table and four chairs. Notepads and pencils were provided for each group member regardless of which media they used for the tasks.

To support the synchronous voice capability, a VTech I5871 5.8 GHz digital spread spectrum expandable cordless phone system with four additional I5808 handsets were purchased for use in the study (Figure 5). Though somewhat unconventional in appearance, the I5871 was one of the only commercially available cordless phone systems that supported 4-way conferencing between handsets without a telephone line. The base station managed connections between handsets. The handsets themselves allowed hands-free speakerphone operation; the flat platform at the bottom of the handset enabled the phone to stand vertically on a tabletop in front of the participants. A small color display was active during the handset's operation indicating the current time and call duration (though the provision of these features was unintentional).

Figure 5. Base Station and Handsets for Voice Conference Capability

To support the synchronous text condition, one of four identically configured Macintosh laptop computers was provided for each participant and installed with the Skype chat client for use during the study. Skype was selected based on the recommendations of a departmental information technology specialist for its perceived reliability and potentially lower latency because the traffic between clients was not routed through a central server if they were operating within a bank of similar IP addresses on the same network. Each laptop and chat client was pre-configured before the groups convened with one of the four participant's names so that no additional time would be lost logging into the computers or user name servers.

Figure 6 has been reduced to fit the page; the actual interface filled the width of the laptop screen to limit participants' temptation to check e-mail or browse the Internet using any of the underlying icons that might otherwise have been visible on the desktop.

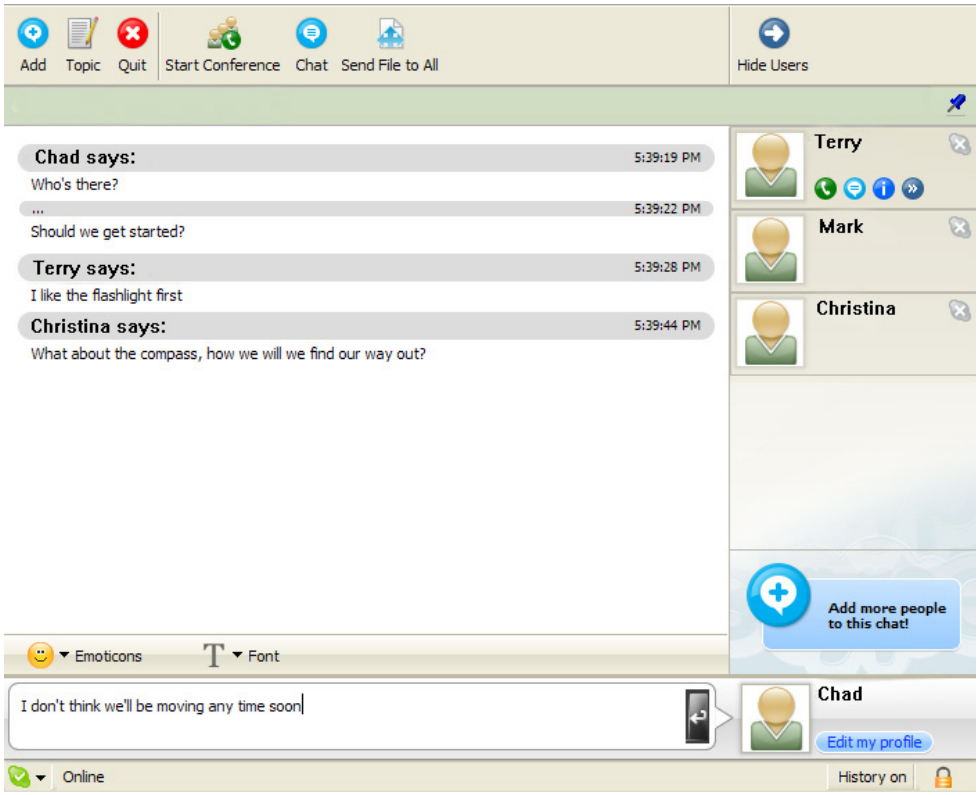


Figure 6. Skype Interface for Chat Capability

The right side of the screen indicates the members of the chat session who are online at the time. Generic avatars were used to maintain consistency of the interface. Each avatar could be highlighted individually to engage in a private chat if the user desired. The lower portion of the screen indicates the current user's identity and provides a space for text entry. Each new entry into the chat is highlighted with a grey byline and time stamp indicating who submitted what comment and when; the strength of the highlighting is reduced and the user name limited to an ellipsis if a single user submits more than one separate comment before others answer.

For the face-to-face condition, all group members met together in one room and sat at a single rectangular table two abreast and facing the others from across the table. The chat log was used as a record of the chat-based interactions; digital voice recorders

were placed in each participant's room to record all sides of the conversation during the voice conference; and two digital voice recorders were placed at either end of the table in the face-to-face meeting room. Figure 7 indicates the sequence of events for each task group meeting held over the course of three consecutive days.

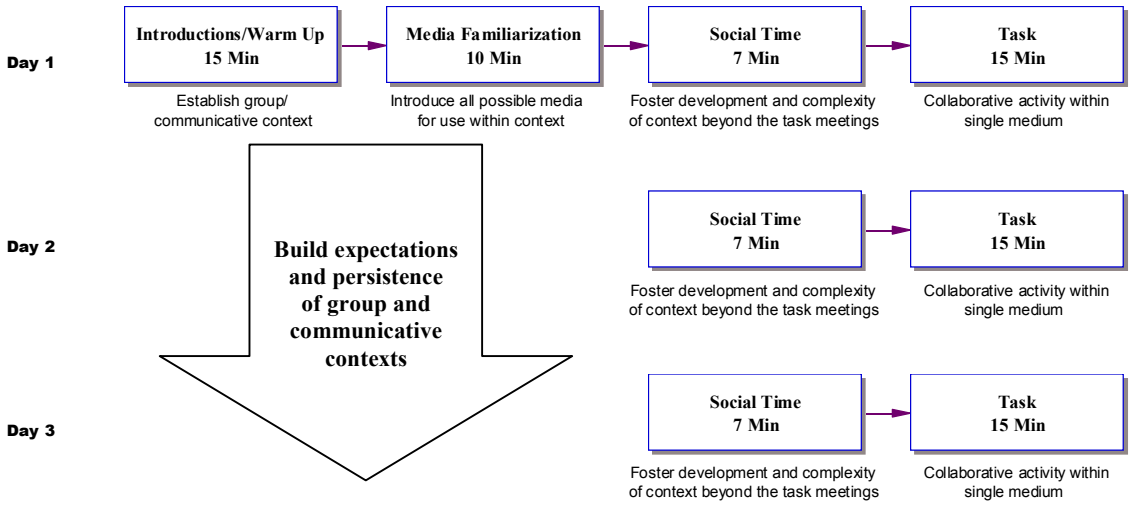


Figure 7. Longitudinal Study Design: Task Group Meetings and Sequence of Events

1. Day 1

Group members first met with the principle researcher in one of the four study rooms; all book bags, cell phones, and other communication devices were collected and secured in a fifth study room so that the only potential source of activity or contact with others during the entire meeting was through action and interaction with other group members. All participants engaged in a 15 minute ice-breaking and personal introduction exercise intended to help establish a small group context and sense of shared history. A basic introduction to the experiment was also provided and informed consent obtained from each member. Participants were not informed at the outset of which media condition they would be assigned for the duration of the study.

All participants were then provided a 10-minute tutorial and familiarization session with both of the communication technologies used in the study, thus mitigating the possibility for a training session on a particular technology to unduly influence "group-building" in one group without the opportunity for it to do so in others. Within the initial meeting room, participants first opened the laptop assigned to them and a trial chat session was conducted to ensure everyone knew how to enter new comments into Skype and identify who was online and responding during the discussion. The trial ended when all participants indicated they understood the interface and felt comfortable conducting a full discussion.

Participants were then given one of the four cordless handsets and led into their own private study room. A short trial voice conference was conducted to help participants adjust the speakerphone volume and physical orientation of the handset during their discussions. Once completed, all participants returned to the first meeting room. The researcher then left the room to prepare copies of the materials required for the day's tasks; however, the absence was timed to last exactly 7 minutes. This additional "social time" was offered as a means of providing an opportunity to continue developing a communicative and social context, group identity, and perhaps even relationships between group members that extended beyond the task setting.

Upon returning, participants were informed as to which medium they would be using for the duration of the study and were provided with the first set of task materials. Group members were given 5 minutes to read the task but could not begin writing. All groups completed the same task (stranded in the desert) on the first day. When they finished reading the task, participants either remained in the same room for the face-to-face discussion or were led back to their respective study rooms with a cordless handset or laptop for the technology-enabled discussions.

For the chat and voice conference conditions, the researcher remained in one of the study rooms until all participants confirmed they were online or could hear everyone else over the handsets. Participants were then given 15 minutes to complete the task; the researcher did not remain in any of the study rooms during the tasks themselves to limit the chances of performance anxiety or surveillance effects beyond those already facilitated by the media or recording devices. When the task was complete, the participants were dismissed and directed to return to the same initial meeting place at the same time 1 day later. Given how little time was actually spent administering the structured experiences and the possibility that group members were most likely strangers before the experiment began, the passage of an intervening day seemed a reasonable amount of time to create the illusion of a persistent group and communicative context, but was not so long as to let the memories and perceptions of the prior experiences fade.

2. Day 2 and Day 3

The procedures for the second and third meetings were identical to those of the first day without the initial introductions or familiarization training. Participants were first left alone in the same room for 7 minutes while the researcher prepared copies of the day's task materials. Once the researcher returned following 7 minutes if social time, the next task was provided: improving the environment on the second day, and settling the disciplinary case on the third day. Again, participants were given 5 minutes to read but not to begin writing or brainstorming ideas. When ready, participants either remained in place or entered the private study rooms with a cordless handset or laptop. Each day's meeting was conducted using the same medium that the group was assigned on the first day. Upon completion of the third task, arrangements were made to conduct follow-up interviews supporting Phase 3 of the study.

Chapter VI - Phase 2 Results, Behavioral Indices of Influence

A. Independent Measures of Influence Messaging Behaviors

All 18 task group meetings were transcribed verbatim and then stripped of identifying features including names, if used, and time and sender stamps from the chat logs. Punctuation, capitalization, and abbreviations from the chat logs were also corrected to match the grammatical style of the face-to-face and voice transcripts. Two graduate student coders were recruited from within the principle researcher's academic department; they were not informed as to the research objectives of the study, nor to the media condition from which each transcript was drawn.

Using definitions comprised of common features from the key influence messages, the coders worked together on a sample transcript from the scrapped voice group and two randomly selected transcripts to identify occurrences of the seven key influence messages (rational persuasion, consultation and idea support, ingratiation, exchange, coalition tactics, pressure, and upward appeals). These test cases established proficiency with the coding criteria and a suitable percentage of inter-rater reliability (at least 90 percent agreement) to begin coding the rest of the transcripts. Incidence of each type of influence message was analyzed to determine whether influence messaging behaviors differed between media.

B. Coding and Reliability

Early inter-rater agreement was measured at 0.95 across the first three transcripts; the coders then coded each of the remaining transcripts separately. The order in which transcripts were coded was selected at random. At the conclusion of each coded transcript, the coders discussed and compared their responses to gain further insight into

the other's thoughts regarding their respective coding decisions. Post-hoc agreement between both coders about the expression of particular influence messages was noted; however, only independent coding agreement was used for the reliability estimate. Average agreement was 0.70 by the last transcript. Using the Cohen's Kappa estimate of reliability for two-person ratings of categorical data, inter-rater reliability was computed as $K = 0.416$, indicating moderate reliability (0.60 to 0.80 is considered substantial, 0.81 and higher is outstanding to nearly perfect; Landis & Koch, 1977). However, closer inspection of the Cohen's Kappa calculations (Table 17) revealed a much higher degree of inter-rater *agreement* despite the apparent lack of strong *reliability*.

			Rater 1 Influence Message #									
			1	2	3	4	5	6	7	8	Σ Row	(Σ Row * Σ Column) / n
Rater 2	Influence Message #	1	3								3	0.019
		2		55						14	69	11.309
		3			0						0	0.000
		4				5				1	6	0.087
		5					10			1	11	0.228
		6						260		52	312	203.900
		7							0		0	0.000
		8		24		2		55			81	11.427
	Σ Column		3	79	0	7	10	315	0	68	333	(Σ Diagonal)

a = 333 (total agreement, Σ diagonal cells)
n = 482 (total observations)
e = Σ cells on diagonal for each ((Σ Row * Σ Column) / n) = 226.971 (expected agreement on diagonal)
Kappa = (a - e) / (n - e) = 0.416 (ratio of surplus of agreements over expected agreements)

Table 17. Cohen's Kappa Estimation of Inter-Rater Reliability for Categorical Data

The numerical column and row headings (1 through 7) in Table 17 correspond to one of each of the seven key influence messages: coalition tactics, consultation/idea support, exchange/reciprocity, ingratiation, pressure/assertiveness, rationality/rational persuasion, and upward appeal, respectively. The eighth heading is a dummy variable for those instances where one rater identified the occurrence of a particular influence message while the other identified none at all. Numbers along the diagonal indicate cases

where both raters agreed on the type of influence message expressed in a particular line of the transcript. Differences of opinion are noted off-axis, such as one rater identifying a passage as influence message type 1 and the other type 3. However, all disagreements fell along the dummy variable axes, indicating that there were no differences of opinion concerning the type of influence message expressed in a particular passage; only whether one was expressed at all at that particular point in the transcript.

Nearly all of these discrepancies were reconciled during the post-coding discussions; only 11 codes remained in question between raters once all coding was complete. Therefore, given the moderate degree of reliability (as estimated by Cohen's Kappa) but high degree of inter-rater agreement (evidenced during the post-coding reconciliation), final coding decisions were based on the agreed-upon ratings from both sets of coder reviews—one independent, the other post-hoc—thereby reducing overall error variance for the seven dependent measures. This coding convention resulted in a combined inter-rater agreement of 0.98 with 471 individual instances of the seven key influence messages recorded over 118 pages text.

C. Frequency of Influence Messaging

Of the seven key influence messages, no group expressed exchange/reciprocity or upward appeal messages across any task, condition, or replication; these measures were dropped from additional statistical analyses. Mean frequency of influence message expression (and standard deviation) for the five remaining influence message types appear below. Visual inspection of the results indicates that rationality/rational persuasion and consultation/idea support were most consistently and frequently enacted across all tasks, media conditions, and between replications. Pressure/assertiveness, ingratiation, and especially coalition tactics appeared to be much less common; in fact, no coalition tactics messages were expressed at all during the replication.

First Trial				
Media Condition	**Influence Message**	**Task**		
		1. Desert	2. Environment	3. Discipline
Face-to-Face	Coalition Tactics			
	Consulation/Idea Support	2.00 (1.41)	0.75 (1.50)	1.00 (0.82)
	Ingratiation		0.50 (0.57)	
	Pressure/Assertiveness			
	Rationality/Rational Persuasion	7.50 (6.61)	6.75 (3.86)	6.50 (1.29)
Voice conference	Coalition Tactics		0.75 (0.50)	
	Consulation/Idea Support	1.25 (0.96)	1.00 (0.82)	3.25 (2.87)
	Ingratiation		0.25 (0.50)	
	Pressure/Assertiveness		1.25 (1.89)	
	Rationality/Rational Persuasion	6.75 (2.99)	3.75 (2.75)	5.00 (2.83)
Chat	Coalition Tactics			
	Consulation/Idea Support	1.25 (0.96)		0.50 (0.58)
	Ingratiation			
	Pressure/Assertiveness			0.25 (0.50)
	Rationality/Rational Persuasion	3.00 (2.58)	2.00 (1.63)	2.25 (1.89)

Table 18. Mean (SD) Expression of Influence Messages by Media and Task

Replication				
Media Condition	**Influence Message**	**Task**		
		1. Desert	2. Environment	3. Discipline
Face-to-Face	Consulation/Idea Support	1.50 (1.29)	0.25 (0.50)	1.25 (0.96)
	Ingratiation			
	Pressure/Assertiveness	0.25 (0.50)	0.25 (0.50)	
	Rationality/Rational Persuasion	7.00 (2.94)	0.75 (0.96)	7.75 (4.57)
Voice Conference	Consulation/Idea Support	1.50 (1.29)	1.33 (0.58)	2.67 (2.52)
	Ingratiation			
	Pressure/Assertiveness	0.25 (0.50)	0.67 (1.15)	
	Rationality/Rational Persuasion	7.50 (6.03)	5.00 (5.20)	9.00 (1.00)
Chat	Consulation/Idea Support	3.25 (3.95)	0.25 (0.50)	1.00 (2.00)
	Ingratiation	0.50 (1.00)	0.50 (0.58)	0.25 (0.50)
	Pressure/Assertiveness			
	Rationality/Rational Persuasion	5.25 (3.77)	2.50 (0.58)	4.50 (1.91)

Table 19. Mean (SD) Expression of Influence Messages by Media and Task (Replication)

These cursory observations were further supported by computing the incidence of each message type as a proportion of the total number of influence messages expressed over the course of the entire study. From greatest to least, the following results were obtained:

- rationality/rational persuasion: 75.80 percent.

- consultation/idea support: 19.53 percent.

- pressure/assertiveness: 2.33 percent.

- ingratiation: 1.70 percent.

- coalition tactics: 0.64 percent.

Recorded measures of influence message expression were analyzed using a three (media type) by three (task) split-plot repeated measures ANOVA (to accommodate the hybrid factorial and repeated measures design) at an alpha level of 0.05 to examine the effects of media (fixed variable) and task (fixed, repeated variable) on the average incidence of influence message expression. Obtained results were adjusted using the Huynh-Feldt correction to guard against violations of sphericity.

During the first set of trials, raters recorded one expression of the coalition tactics message from each of three participants in a single group during only one of the three tasks. Clearly, the observed incidence of coalition tactics messages across the entire study was very infrequent. Not surprisingly, the contrast of this slight expression of coalition tactics messages against the preponderance of zeros for the same measure in the other conditions produced a significant main effect for media, $F(2, 9) = 9.00$, $p < 0.05$; task, $F(2, 18) = 9.00$, $p < 0.05$; and the interaction between the two, $F(4, 18) = 9.000$, $p < 0.05$. Specifically, the mean expression of coalition tactics messages was highest for participants in the voice condition during the second task (M = 0.75, SD = 0.50). However, this figure represents less than one (0.75) coalition tactics message per person and, again, no other coalition tactics messages were recorded during any other task or for any other media condition. Thus, the data suggest that this slight deviation *from* zero was driven to significance because all other comparison values *were* zero.

No other significant main effects for task, media condition, or interactions between task and media were obtained for any of the remaining influence message types.

The replication produced nearly identical results. In all but one instance, results indicated no significant main effects for task, media condition, or interactions between the two.

However, for rationality/rational persuasion messages, results did indicate a significant main effect for task, $F(2, 16) = 10.63$, $p < 0.05$. Mean frequency (and standard deviation) of rationality/rational persuasion message expression was 7.19 (1.26) for the first task, 2.75 (0.82) for the second task, and 7.08 (0.94) for the final task. Bonferroni-adjusted confidence intervals for mean differences suggested that rationality/rational persuasion message expression was not significantly different between the first and third tasks; however, frequency of expression during second task was significantly lower than either the first or third tasks ($p < 0.05$).

The data suggest that the average frequency of influence message expression did not vary systematically between media conditions. However, it generally took participants longer to type something in the chat client than it did for them to speak face-to-face or via the voice-conferencing system. Even accounting for economy of expression (shorter phrases or simpler sentence structure), the chat transcripts typically contained about half the total content of the other two media. Perceptual reports from Phase 3 interviews confirmed these observations as well some the reasons why they occurred. However, with fewer total messages exchanged between participants, it was possible that participants in the chat condition had less opportunity to express their thoughts in general, much less specific influence messages, versus their counterparts in the other media conditions.

D. PROPORTIONALITY OF INFLUENCE MESSAGING

Due to the possibility that the latency inherent in the chat client might significantly limit total communication between group members, it was conceivable that the *proportion* of each influence message expressed individually in relation the total

number of influence messages exchanged within the group might still vary between media conditions even if average frequency of expression did not. Therefore, all dependent measures were converted to a percentage of the total number of influence messages exchanged between group members during each task. This conversion had the added benefit of providing a context or relative scale for the data, especially when overall influence messaging expression was very low. These proportional measures were subjected to the same three (media type) by three (task) split-plot repeated measures ANOVAs at an alpha of 0.05.

Results for the total proportion of all influence messages accounted for by coalition tactics messages during the first set of trials exhibited the same significant main effects for media, $F(2, 9) = 9.000$, $p < 0.05$; task, $F(2, 18) = 9.00$, $p < 0.05$; and the interaction between the two, $F(4, 18) = 9.000$, $p < 0.05$, as were obtained for the measure based on frequency. Again, individual expressions of coalition tactics accounted for a mean proportion of 0.027 (SD = 0.0052) of all influence messages expressed during voice condition group's second task, significantly higher than the proportion of total influence messages coalition tactics accounted for during any other task or using any other media. Of course, the total proportion of influence messages accounted for by coalition tactics during any of other conditions was also zero; therefore, this pattern of results was also expected and should not be interpreted as evidence of a connection between proportionality of coalition tactics to all other influence messages and average expression of coalition tactics as a function of media or task.

A significant main effect for task was also observed for consultation/idea support messages, $F(2, 18) = 3.592$, $p < 0.05$. Mean proportion (and standard deviation) of total influence messages accounted for by consultation/idea support messages expression was 0.055 (0.012) for the first task, 0.020 (0.009) for the second task, and 0.058 (0.017) for the final task. Visual inspection of the data suggest that consultation/idea support messages accounted for a lower proportion of the total influence messages exchanged during the second task than in the first or third (Figure 8); however, Bonferroni-adjusted confidence intervals for mean differences did not indicate significant pair-wise differences between mean proportions for each task.

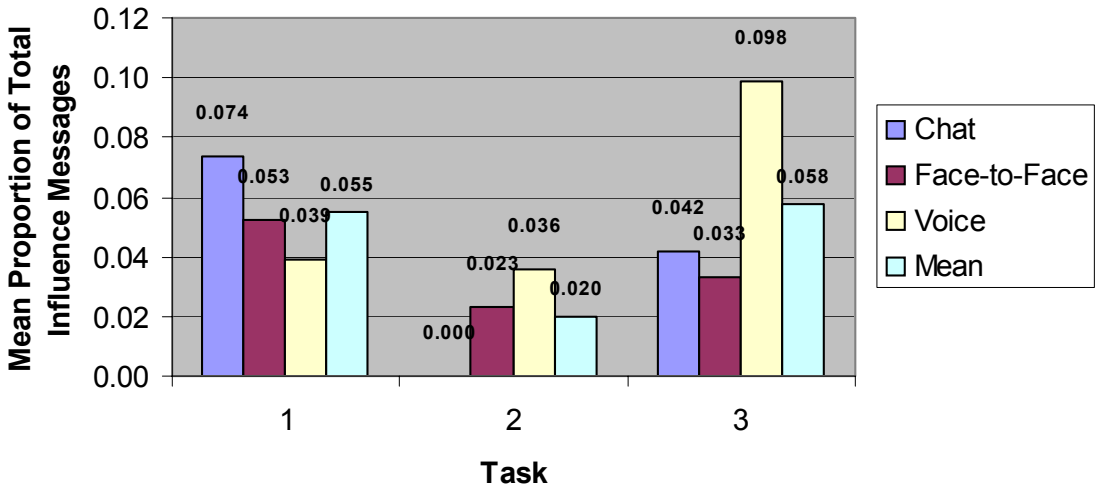


Figure 8. Consultation/Idea Support: Mean Proportion of Total Influence Messages as a Function of Task and Media

No other significant main effects for task, media condition, or an interaction between task and media were obtained for any of the remaining influence message types during the first trials. During the replication, a significant main effect for media was obtained for ingratiation messages, $F(2, 8) = 7.196$, $p < 0.05$. In general, participants in the chat condition expressed ingratiation messages as a larger proportion of their overall

influence messaging activities (M = 0.021, SD = 0.004) than participants in the other two conditions.

However, neither the voice-conference nor face-to-face participants expressed ingratiation messages at all across their respective tasks (M = 0.00, SD = 0.00). Therefore the proportions against which the chat group was compared were also zero. As expected, the Bonferroni-adjusted confidence intervals for mean differences indicated that the mean proportion of total influence messages in the chat group accounted for by ingratiation were significantly higher than proportions for both face-to-face and voice conditions ($p < 0.05$).

Similar to the conditions of coalition tactics expression, ingratiation messages accounted for an average of only 2.10 percent of all influence messages in the chat condition across all three tasks—less than 0.42 messages per person. Thus, this particular effect is also an example of a very small deviation from zero driven to significance by a preponderance of zeros in comparison. The effect itself is statistically significant; however, it is not conceptually significant in light of the actual data or any practical implications. Therefore, the overall pattern of results suggest that the proportionality of influence message expression did not vary systematically or meaningfully between media conditions, just as it had not varied with average frequency of expression.

E. SUMMARY

In relation to Research Question 1, what is clear from the results is that the media capabilities seemed to have little direct impact on the expression of influence *as embodied by the seven specific influence messages* used in this study. That is not to say that the experience of influence in general was *unaffected* by the medium during the structured group experiences, only that the results failed to produce any conceptually meaningful differences between media based on several well-established behavioral

indices of influence. The various mechanisms by which media differences may have impacted other aspects of influence were some of the many subjects discussed during the Phase 3 follow-up interviews.

Chapter VII - Phase 3 Methodology, Lived Perceptions and Experiences

A. Methodological Notes and Background

Phase 3 of the study was designed to explore the issues addressing Research Question 2; specifically, the experienced and perceived nature of the relationships between various media capabilities (implemented through communication technology) and the communicative context in which members of small groups conducted their activities and (presumably) exerted influence on one another. Phase 2 of the study provided a series of structured small group experiences in which such interactions and expressions of influence might take place. Phase 3 therefore involved a retrospective examination of the structured experiences from the perspective of the participants who lived them.

Using the system influence diagram developed during Phase 1 as a guide, semi-structured interviews were conducted in which individuals provided an account of their experiences with each element of the communicative context identified within the system, as well as describe and cast their own votes regarding the experienced direction and nature of the relationship between those elements. The interview process, aside from being a formalized aspect of the IQA methodology, helps establish a degree of rigor concerning construct validity in an otherwise interpretive approach. By re-tracing the nature of the relationships between system elements as identified by the focus group, as well as explicitly reflecting on the meaning of those individual elements during the structured experiences, the interviewees essentially serve as key informants who are able to clarify or re-interpret the system (as suggested in Sarker & Lee, 1998), reconciling the proposed picture of reality developed by the focus groups with the "lived experience" of reality as perceived by the interviewees.

The final result of the individual interview process is a series of descriptive narratives that illustrate the various elements of the communicative context as well as another system of representation—a new system influence diagram that depicts the relationships between elements of the communicative context as they were perceived *in situ* by participants during the structured group experiences. However, because communication technology was already part of that context (as determined by the system produced during Phase 1), the interview protocol did not have to be tailored to examine how differences in media might translate into varying effects within the system. Furthermore, once the interviews were complete, the resultant system could be exercised in a predictive or proscriptive fashion to explain or diagnose some of the behavioral results obtained during Phase 2—essentially improving the construct validity of the study performed by using multiple "measures" of the same phenomenon (Sarker & Lee, 1998).

B. INTERVIEW PROCEDURES

Using the same participants that completed the structured group experiences in Phase 2, the individual interviews began by first probing the participants' initial impressions and reactions regarding each of the system elements during the course of their group meetings. For example, interview questions included such generic openers as, "Tell me about your experiences of group roles," or "Tell me about the way you related to others in your group." An additional element was added to the interview protocol concerning the experience of influence. The interviews also included a section dedicated to describing the ways in which each element influenced, or was influenced by (if at all) every other element, such as "Tell me about the way the chat client influenced logistics," or "How did your emotions affect the group's final product or resolution?" A complete copy of the interview protocol handout is attached at Appendix C.

Interviews themselves were conducted privately with each of the final 23 study participants no later than 7 calendar days following his or her last task group meeting; though most interviews occurred within 48 hours of the last meeting. All interviews were recorded and transcribed word-for-word using third-party services to guard against any pre-emptive interpretation of the transcripts. Interviews lasted an average of 1 hour, 38 minutes, and the accumulated transcripts totaled 700 single-spaced pages comprised of 31,952 lines of text.

C. INTERVIEW ANALYSES

The administration of the interview protocol helped isolate individual perceptions and experiences of each affinity or relationship between affinities to a particular portion of the interview itself. Therefore, within the sections of the transcripts dedicated to each affinity, any individual utterances, passages, or even a series of exchanges between the participant and interviewer that alluded to a single thematic element, *regardless of what that element might be*, was copied into an Axial Code Table that included the relevant passages from the transcript, the transcript source, and any researcher notes regarding an extant or implied thematic element.

Similarly, any discourse that alluded to the nature of the relationship between affinities was copied into a Theoretical Code Table that also included the exact passages, source, and notes regarding the nature of the relationship (the use of Axial and Theoretical Code Tables are described more in depth at Appendix A, Part IV, Sections A through D). Passages that alluded to more than one theme, affinity, or relationship were edited at the point of the subject change to the extent possible such that each quotation or series of quotes only pertained to a single subject while still representing enough of the original discourse to complete the relevant thought or idea.

However, it was common for participants to discuss their perceptions and experiences of one affinity in terms of another, especially as they worked further into the downstream system affinities. For example, participants might have vividly described a relationship between the face-to-face setting and *Logistics* even though they were in the middle of recounting how they experienced or perceived *Synergy*. Therefore, all sections of the transcripts were re-read and re-coded for any additional discourses that alluded to a particular affinity or relationship. The actual number of discrete passages or sections of discourse ranged from as few as three total comments for a very simple, one-themed or one-dimensional relationship between affinities, to as many as 63 separate comments or exchanges pertaining to a complex and multi-faceted affinity—one with many themes and elements relevant to the participants' experiences.

Once the data from all transcripts were transferred to the appropriate tables, passages and exchanges were grouped based on commonalities or recurrence of thematic issues and elements identified in the researcher notes section for each segment of quoted material. For example, as participants described how a particular medium affected their emotions, two themes may have emerged: one, the emotional reactions of the participants themselves; two, the ability to read or interpret the emotional states of others. Assuming 10 individual comments or discourses were recorded overall, the percentage of comments pertaining to each *specific* theme provided a proxy measure of how representative those sentiments, perceptions, or experiences were amongst the totality of responses concerning the relationship between medium and emotions.

However, to keep a single participant from biasing the apparent representativeness of the results, only one participant's comment *per issue or theme* was included in the percentage calculations. Therefore, a single respondent might have provided discourse on several themes for a single affinity or relationship, yet only one

comment or exchange *per theme* was included in the percentage figures reported in the Phase 3 results. In the example above, assuming one person expressed four of the ten comments, all of which indicated that the medium hampered the ability to read and interpret the reactions of others, percentages of representativeness for the two extant emotional themes would be based on seven, rather than ten, total comments.

Normally, an IQA-based approach to results reporting would then simply combine all such discourse from every participant into a smooth-flowing narrative—one voiced as if originating from a single person. While such a narrative provides colorful and rich descriptions of the relevant phenomena, it also implies a continuity of thought that is manufactured. Moreover, the onus of interpretive responsibility is left primarily to the reader who must still wade through the story that unfolds within the narrative in order to appreciate the underlying meanings. Therefore, formatting and analysis of the interview results did not proceed in exact accordance with IQA reporting guidelines as outlined in Appendix A.

Instead, summaries of common thematic elements, perceptions, and experiences were generated, along with some indication as to how prevalent those experiences and perceptions were to the participants in the study. In addition, representative quotations culled from applicable transcripts—rather than an entire narrative constructed from pieces of many transcripts—were used to add some richness and depth to the reporting by grounding the summary perspectives within the words of the participants themselves.

The following chapter provides an account of the results obtained during the individual interviews. First, the composite perceptions of the structured group experiences will be described through a new system influence diagram based on the relevant interview data. Second, the thematic summaries and content analyses will be provided of the interview results that illustrate perceptions and experiences of the various

media used during the study, influence as it was perceived and experienced during the study, and the ways in which the media was found to impact other elements of the communicative context during the study.

Chapter VIII - Phase 3 Results, Perceptual and Relational Discussions

A. Composite System of Representation for the Communicative Context

Each interview included a section dedicated to the relationships between each of the eleven composite affinities. Using the same principles that created the composite system influence diagram in Phase 1, the interviews provided additional depth and richness by eliciting a discourse that *illustrated* the relationships between affinities, rather than *indicating* the direction through a response on a table. Specifically, participants were instructed to describe perceived relationships (if any) between two affinities and provide examples *in terms of the study*. Interview transcripts were then used as source material for the affinity pair code (one per person) resulting in a total of 1,027 individual votes to create a new system influence diagram representing the participants' perceptions of the structured group experiences. Complete results of the second IQA Pareto protocol also appear in Appendix B; an excerpt from the relevant power analysis table appears below.

Affinity Pair Relationship				Frequency Sorted (Descending)	Cumulative Frequency	Cumulative Percent (Relation)	Cumulative Percent (Frequency)	Power
1.	3	←	6	21	21	0.9	2.0	1.1
2.	3	←	7	21	42	1.8	4.1	2.3
3.	3	←	11	21	63	2.7	6.1	3.4
4.	1	→	3	20	83	3.6	8.1	4.4
5.	3	←	9	20	103	4.5	10.0	5.5
6.	4	→	8	20	123	5.5	12.0	6.5
7.	6	→	10	20	143	6.4	13.9	7.6
8.	1	→	8	19	162	7.3	15.8	8.5
9.	4	→	11	19	181	8.2	17.6	9.4
10.	5	→	11	19	200	9.1	19.5	10.4
11.	8	→	9	19	219	10.0	21.3	11.3
12.	8	→	11	19	238	10.9	23.2	12.3
13.	1	→	5	18	256	11.8	24.9	13.1
14.	1	→	10	18	274	12.7	26.7	14.0
15.	3	←	5	18	292	13.6	28.4	14.8
16.	3	←	8	18	310	14.5	30.2	15.6
17.	4	→	5	18	328	15.5	31.9	16.5
18.	5	→	7	18	346	16.4	33.7	17.3

19.	6	→	11	18	364	17.3	35.4	18.2
20.	1	→	7	17	381	18.2	37.1	18.9
21.	3	←	10	17	398	19.1	38.8	19.7
22.	1	→	2	16	414	20.0	40.3	20.3
23.	2	→	8	16	430	20.9	41.9	21.0
24.	4	→	10	16	446	21.8	43.4	21.6
25.	5	→	9	16	462	22.7	45.0	22.3
26.	1	→	4	15	477	23.6	46.4	22.8
27.	2	→	3	15	492	24.5	47.9	23.4
28.	2	→	11	15	507	25.5	49.4	23.9
29.	4	→	9	15	522	26.4	50.8	24.5
30.	8	→	10	15	537	27.3	52.3	25.0
31.	2	←	6	14	551	28.2	53.7	25.5
32.	3	←	4	14	565	29.1	55.0	25.9
33.	5	→	10	14	579	30.0	56.4	26.4
34.	9	←	10	14	593	30.9	57.7	26.8
35.	1	→	9	13	606	31.8	59.0	27.2
36.	1	→	11	13	619	32.7	60.3	27.5
37.	2	←	7	13	632	33.6	61.5	27.9
38.	6	→	7	13	645	34.5	62.8	28.3
39.	9	←	11	13	658	35.5	64.1	28.6
40.	2	→	10	12	670	36.4	65.2	28.9
41.	4	→	7	12	682	37.3	66.4	29.1
42.	5	←	8	12	694	38.2	67.6	29.4
43.	6	→	8	12	706	39.1	68.7	29.7
44.	7	←	8	12	718	40.0	69.9	29.9
45.	2	←	4	11	729	40.9	71.0	30.1
46.	2	→	5	11	740	41.8	72.1	30.2
47.	6	→	9	11	751	42.7	73.1	30.4
48.	7	←	10	11	762	43.6	74.2	30.6
49.	7	→	11	11	773	44.5	75.3	30.7
50.	10	→	11	11	784	45.5	76.3	30.9
51.	10	←	11	11	795	46.4	77.4	31.0
52.	5	→	8	10	805	47.3	78.4	31.1
53.	7	→	10	10	815	48.2	79.4	31.2
54.	2	←	10	9	824	49.1	80.2	31.1
55.	5	←	6	9	833	50.0	81.1	31.1
56.	7	→	9	9	842	50.9	82.0	31.1
57.	2	←	5	8	850	51.8	82.8	30.9
58.	2	→	9	8	858	52.7	83.5	30.8
59.	4	←	6	8	866	53.6	84.3	30.7
60.	7	←	11	8	874	54.5	85.1	30.6
61.	1	→	6	7	881	55.5	85.8	30.3
62.	2	←	9	7	888	56.4	86.5	30.1
63.	7	←	9	7	895	57.3	87.1	29.9

Table 20. Power Analysis Table from Individual Interview Pareto Protocol

The power analysis table indicates that at least 80 percent of the total variance was accounted for within the first 56 affinity pair relationships; seven additional relationships were selected so that at least one instance of every possible pairing was included for consideration in the final System Influence Diagram. Thus, a total of 63 relationships accounting for 87.1 percent of the total expressed variance were selected (highlighted above), including 8 conflicts that would have to be reconciled in the final system. Figure 9 depicts the cluttered system influence diagram that was created following a number of additional steps for data reduction and representation.

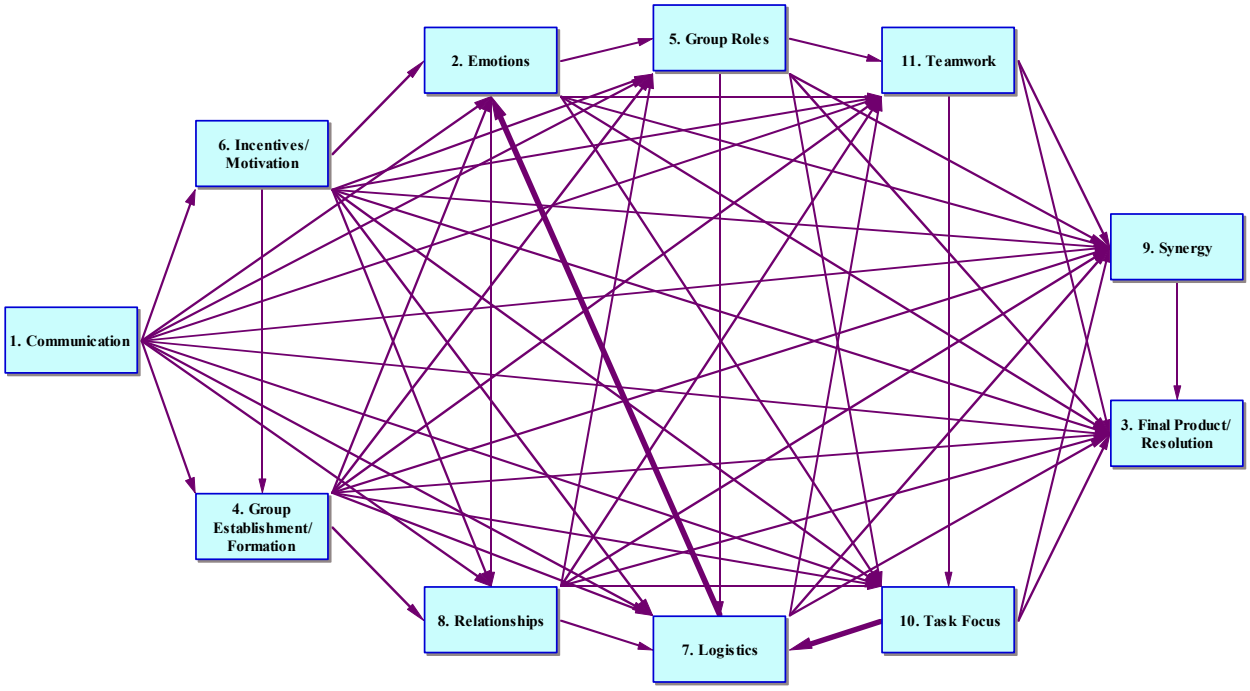


Figure 9. Cluttered SID – Individual Interviews

Again, this particular system encompasses all of the affinity pair relationships above the MinMax criterion from Table 20, but has not yet been rationalized to remove redundant connections between affinities. Once the system was rationalized, conflicting relationships that survived the MinMax criterion from the Pareto protocol were added

back into the system (Figure 10) before a final rationalization process rendered a composite system influence diagram for the study participants (Figure 11).

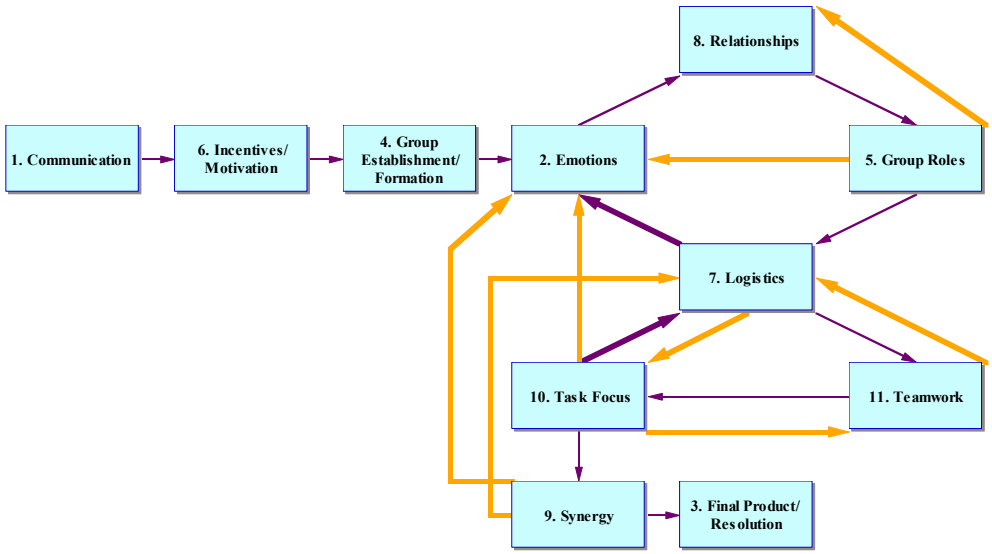


Figure 10. Uncluttered SID Including Conflicts (Orange Links) – Individual Interviews

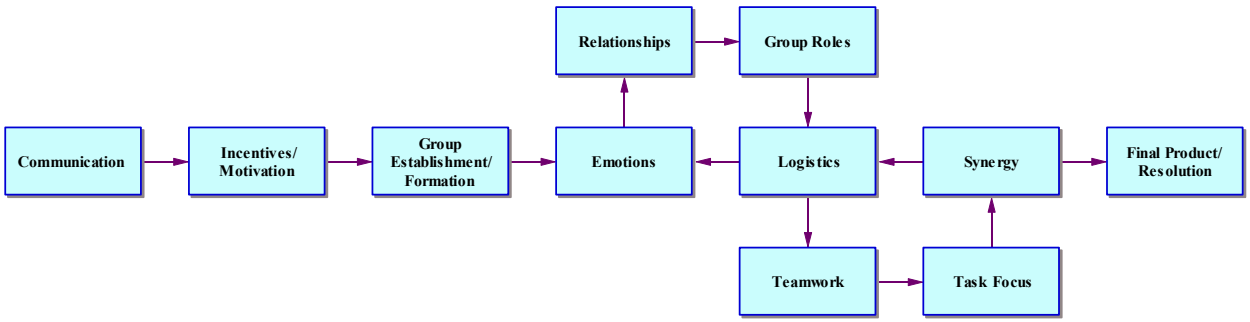


Figure 11. Pareto-Reconciled Uncluttered SID – Individual Interviews

The topology of the participant system indicates a fair amount of deterministic thinking at the driving end of the system. In particular, upstream perceptions and experiences of the group meetings that were administered in Phase 2 of the study were not subject to a great deal of feedback or downstream adjustments based on the ongoing activities of the group. Instead, whatever feelings or perceptions the participants had

about communication (including the medium they were using), incentives and motivation, and group establishment and formation would ultimately decide the outcome of the entire system of experience including how well the group met the requirements necessary for the desired final outcome or resolution. Furthermore, no amount of "good" or "bad" experiences associated the other affinities were likely to change those initial feelings or perceptions. However, outcomes or ongoing experiences associated emotions, relationships, group roles, logistics, teamwork, task focus, and synergy did have the potential to interact and change the "ground rules" of the ongoing group interaction, as well as affect overall valences about the various system affinities and the success or failure of the group's ultimate final product or resolution.

The affinity with the single most powerful affect on the entire system of perception (within the structured group experiences) was communication—an affinity which includes the media capabilities under investigation. In relation to the answers to Research Question 2, this system influence diagram indicates that the participants' experiences and perceptions of all other system affinities were directly impacted by the medium they used to engage in group activity and communication. In essence, the medium influenced the outcome or "value" of every relevant aspect of the communicative context. Moreover, the strength of those effects was so potent and so salient that no other events or experiences could overcome the perceptions of the medium in any meaningful way. Exactly *how* those effects were translated into perceptual reality for the study participants will be the focus of the next several sections.

In particular, interview results will be presented that include the collective perceptions and experiences of the media capabilities used in this study, as well as the various media's effects on each of the other affinities within the system of inquiry. An affinity analysis will be provided for the *Communication* affinity that represents each

media capability, and a similarly formatted discussion will follow that details how that affinity influenced or affected all other affinities (Figure 12) within the larger system of relationships. Separate discussions of *Influence*, as it was experienced by the study participants, will also be presented, as will the perceived relationships between *Communication* and *Influence*. All of these discussions and results ultimately provide the foundation for answering Research Question 2: how does communication technology affect or change the communicative context in which influence messages are produced and exchanged?

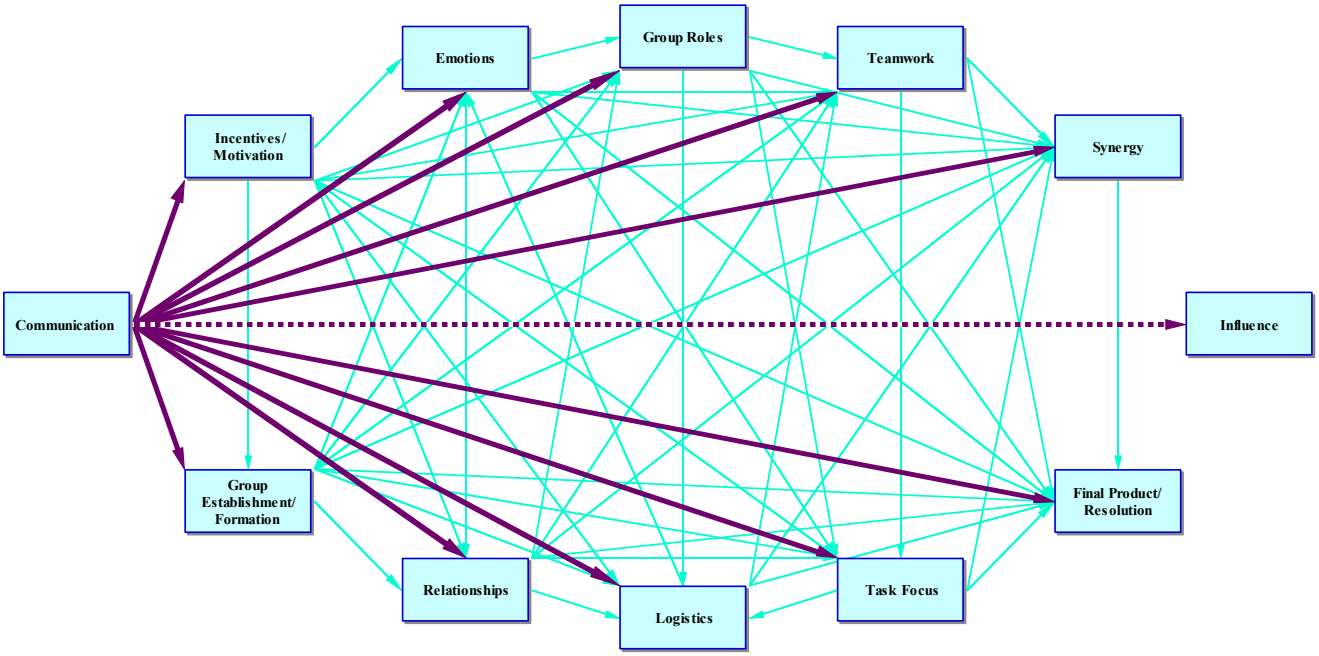


Figure 12. Influence of Communication on Participants' System of Experience and Perception

Each affinity and affinity-pair relationship analysis will be preceded with a tabular summary indicating all of the major issues and themes that emerged from the relevant interview data. These issues and themes appear on the summary tables in descending order of commonality or representativeness (based on the proportion of the total number of discourses and comments recorded on the appropriate Axial and

Theoretical Code Tables). Following each table, an interpretive summary of the interview results will also be provided as well as relevant quotations and excerpts from the interview transcripts to provide some sense of the lived experience of the data presented in the tabular summaries.

B. COMMUNICATION: FACE-TO-FACE

1. Affinity Analysis

Common perception/experience	Result
Availability of non-verbal physical and sensory feedback cues from others	Affected rhythm of conversation
	Ease in gauging reactions of others
	Heightened sense of presence
	Heightened accountability of/to others
Common reference issues	Ease of maintaining collective memory
	Ease in coordinating efforts
Timekeeping issues	Use of timekeeping capabilities unintentionally provided with recording devices
High verbal bandwidth (implicit)	Faster/greater exchange and variety of verbal messages (see discussions of *Synergy* and *Final Product/Resolution* for specifics)

Table 21. Face-to-face Medium Affinity Analysis

The face-to-face medium supported a number of possibilities for non-verbal expression beyond the voice conference or chat. Not surprisingly, 53 percent of the participants' comments centered on the availability or importance of non-verbal sensory and feedback cues. The most common observations concerned these cues' impact on conversational flow, rhythm, and structure. Specifically, visual and feedback cues such as body language helped determine when someone else wished to speak, or when it was appropriate to join the conversation at all.

The remaining two issues associated with sensory and feedback cues were evenly divided. First, participants said they used body language and other non-verbal cues to help gauge the reactions of others such as confusion or judging when something needed to be re-phrased or re-emphasized. Second, participants reported a greater sense of accountability or presence of others simply by being in the same room together; specifically,

> If two people would have been talking at the same time, I know at least one of them would have been hearing at least part of what I was saying.

The usefulness of a common reference or system for managing collective memory and coordinated effort was mentioned less often, accounting for 26 percent of the comments. Participants indicated they had used their paper and pen for their own responses as well as to physically share their answers or notes so that the group would collectively appreciate what was accomplished. They also used their note pads as a common record for the sake of economy of effort—only one person kept track of the "official" results or decisions rather than everyone.

Perceptions relating to the passage of time were expressed least often (only 21 percent of the relevant comments) though individual discourses suggested all participants were sensitive and responsive to time-keeping issues regardless. For instance, while one group member used her watch to keep track of time for her group, participants in the second face-to-face group used the timers on the digital recording devices. Without a sense of the passage of time, participants believed their groups would likely have kept talking until the allotted time passed rather than trying to finish amidst a "manufactured" sense of urgency.

An additional component of the face-to-face medium had to do with verbal bandwidth. However, this aspect of the medium was not explicitly articulated during the

interviews; instead, it was implicit based on the descriptions of how the medium affected *other* affinities. The results reported in subsections *3.i. Synergy*, *3.j. Final Product/Resolution*, and *3.k. Sidebar* address how the bandwidth issues were manifest through various perceptual and experienced effects.

2. Perceptions and Experiences of Influence

Common perception/experience
Passion and conviction of others
Guiding or pacing group activity and focus
Rationality or persuasiveness of information
Individual characteristics
Implicit influence: majority and conformity

Table 22. Influence Affinity Analysis for the Face-to-Face Medium

The most common experiences and perceptions of influence (24 percent of the participant comments) were based on the passion and conviction with which others expressed their views and opinions regardless of what those views and opinions were. As one participant described it, influence was primarily a function of:

> Most definitely the passion and the conviction with which someone said something. Like if they said, "Oh, I don't really care," then I don't particularly care what you think because you don't care what you think. But if they said, "I really care about this, I want it *this* way," then I though, "Wow, you really care. Maybe there's a really good reason that you care and I should try to see why."

Nearly as common (22 percent of the comments) were sentiments of influence in terms of affecting the pace or flow of the group's activity, e.g.,

> I would just say, "Well, how about we move on," or "How about we do this," suggestions that can guide people in the way that I want them to go….that's how I used my influence;

or in terms of effort to re-frame or re-focus of the problem space,

> We would bring up a couple of items and then narrow what we thought the next two or three most important items were and pitched those out. We would say, "Okay, which one do you think is most important, this or this, discounting the rest?" So in that way you're influencing the scope of what everybody is choosing from.

The remaining 54 percent of the participant comments were divided equally between three issues. First, influence was based on the persuasiveness or rationale of *information itself*:

> People would suggest an idea and give reasons to support that…Sometimes they were points I had not thought of and it made me look at it in a different way.

Second, age and experience were influential, resulting in perceptions that those who had families or who had graduated college were "wiser" than the rest of the group. Finally, forces of implicit or majority influence were manifest in terms of individual perception—collective actions and decisions seemed to validate an individual member's positions or opinions—and in terms of pressure to keep the group running as smoothly as possible, e.g.,

> …because it wasn't so important to me that my opinion was counted as much as it was that we all kind of had a good time in the group and everything went well.

3. Affinity/System Relationships

a. Communication → Incentives/Motivation.

Aspect/Theme of Face-to-Face Medium	Effects
Heightened sense of accountability	Social pressure to complete task

Table 23. Face-to-Face Impact on Incentives/Motivation

All participants in the face-to-face setting reported that they were compelled to complete each task due to the social pressures resulting from explicit accountability to others, e.g.,

> …if you're on chat or on the phone, it's easy to forget there's a person there if they don't say anything; if they are right there with you, they can look at you and say, "Why isn't she saying anything?"

This explicit sense of accountability resulted in behavior and perceptions consistent with self-monitoring or social desirability; participants reported expending time and effort in the tasks because they did not want to seem less willing or less professional than the others in the group.

b. Communication → Group Establishment/Formation.

Aspect/Theme of Face-to-Face Medium	Effects
Availability of physical and sensory feedback cues from others	More meaningful and more "real" experience
	Deeper connection to others
Reading/interpreting reactions of others	More positive feelings about group as a whole

Table 24. Face-to-Face Impact on Group Establishment/Formation

Physical and sensory feedback cues were the only media issues perceived as responsible for perceptions and experiences of the group's establishment and formation *as a group*. The participants suggested that the cues themselves, rather than any mediating effects of those cues, made the group experience "more meaningful" or "more real" beyond simple physical proximity,

> I believe that as you see each other's expressions and you actually look into each other's eyes, you have some sort of connection other than just the task, like some sort of unspoken bond.

Such connections were also deepened due to the ability to read and interpret the reactions of others—participants reported they simply "felt better about the group" because they were able to see whether others were agitated, relaxed, or having fun.

c. Communication → Emotions.

Aspect/Theme of Face-to-Face Medium	Effects
Communication setting/medium	Familiarity of setting was comfortable
	Put people at ease for speaking with others
Reading/interpreting reactions of others	Accurately interpret emotional states of others
	React accordingly based on perceived emotional states of others

Table 25. Face-to-Face Impact on Emotions

The most common emotional effects were positive reactions to the face-to-face medium itself—typically a sense of ease and familiarity that made participants comfortable personally and at ease to talk with others. In addition, the non-verbal cues that provided information about how others were reacting during the tasks enhanced the ability to read and interpret the emotional conditions of others, allowed for a more effective interpretation of the on-going conversation, and provided indications as to how the conversation might progress, much as the following participant description indicated,

> …by being able to see the people that I was working with, I could gauge how they were feeling and it calmed me down. If there was a disagreement, it wasn't like they were disrespecting me; it was just a disagreement because I could see them and I reacted to that…and my emotions about the process was affected by being face to face—able to see other people.

d. Communication → Relationships.

Aspect/Theme of Face-to-Face Medium	Effects
Reading/interpreting reactions of others	Easier to interpret hidden or "real" meanings in others' behavior
	Temper own responses to perceived disagreements
Heightened accountability to others	Enact social norms and self-monitoring
	More cordial and friendly relations

Table 26. Face-to-Face Impact on Relationships

The most common sentiments participants expressed (53 percent of the comments) indicated that being face to face provided participants greater accuracy for interpreting the "real" meaning of someone's words—"hearing what people are *not* saying"—as well as their relational intentions through their overt behaviors, tone of voice, or body language during the ongoing group interaction. Such hidden meanings were used to shape one's own relational behaviors towards others; for instance,

> I did not feel disrespected when we had a disagreement because I could tell or I could see the intentions or how someone felt when they were saying something. If there weren't those visual cues, I might have read it a different way and my relationship might have been different with that person.

Nearly as common were perceptions that the face-to-face medium heightened a sense of accountability within the group. In turn, participants were able to enact or enforce many positive relational behaviors based on social norms or self-monitoring, i.e.,

> Because you could see each other, you certainly are going to pay attention to the relationships; you're not going to want to offend anybody—you want to make everybody feel comfortable *because* it's face-to-face.

e. Communication → Group Roles.

Aspect/Theme of Face-to-Face Medium	Effects
Natural rhythm and flow of conversation	Reduced "administrative overhead"
	Little need for leader/manager role
Reading/interpreting reactions of others	Determine who wants to assume role
	Determine how others in group respond to role
Heightened sense of presence	Easier to assume certain roles
Heightened sense of accountability to others	Roles required to keep group moving/active
Ease of sharing common reference	Improved economy of effort and organization
	Secretarial role to serve as collective memory

Table 27. Face-to-Face Impact on Group Roles

All four themes associated with face-to-face's physical and sensory feedback cues were invoked across nearly two thirds of the participant comments. For instance, the natural rhythm and flow of the conversations made it less necessary for roles to be assigned, especially leader or manager-type roles to deal with the administrative overhead of keeping the discussion on track. The ability to see and analyze the reactions of others was also important to determining who was trying to assume what role within the group, and how those roles were received, e.g.,

> You can gain eye contact with others to see if they also disagree with the way something's gone or how someone took the leadership role…you can see how they felt about the leader and if they had a negative opinion.

Certain roles (if necessary at all) were also easier to assume due to the heightened "presence" of certain individuals within the group; for instance,

> Some people just have a presence…they are like, "I'm here," and everybody feels it. So I guess those are natural leaders and you can feel that if you're in a room with them.

Finally, participants felt accountable to each other to keep the group's efforts moving and thus needed someone to "kick the group into gear" during lulls in the conversation that were especially awkward with everyone sitting in the same room.

The remaining comments centered on common reference issues that resulted in the emergence of at least one secretarial or scribe-type role within each group during every meeting. Such roles were necessary for keeping the group's efforts organized and for keeping track of the group's final answers even if everyone else was taking "working notes" along the way.

f. Communication → Logistics.

Aspect/Theme of Face-to-Face Medium	Effects
Heightened sense of accountability to others	Able to monitor activities of others
	No need to make logistical requirements explicit: everyone is "right there" to see/hear
Reading/interpreting reactions of others	Less effort expended coordinating activities
Ease of sharing common reference	Off-load logistical overhead to single person

Table 28. Face-to-Face Impact on Logistics

Non-verbal cues that afforded perceptions of enhanced accountability and the ability to interpret reactions and responses of others accounted for 64 percent of the participant discourses. For instance, participants not only spoke to each to each other during the tasks, they could see what others were looking at and whether their own input was heard or considered because the rest of the group was "sitting right there." Furthermore, less logistical overhead was required to ensure everyone kept pace and with

the group's efforts because non-verbal feedback signals provided implicit information about various members' collaborative needs within the group, e.g.,

> It wasn't like it would have been over the phones, "Laura what do you think, Matthew, what do you think?" Instead…we are able to nod and shake our heads and that kind of thing being face-to-face…you can get that positive reinforcement as you're making a point; you see someone agreeing with you…you wouldn't have to ask if we all agree.

The ability to easily share a common reference was another frequently mentioned theme that accounted for the remainder of the participant comments. Reports indicated that a single individual maintained the collective memory of the group and explicitly monitored its progress on a notepad while the remainder of the group simply focused on completing the task:

> Because we were in the same room and because we could see everyone…we divvied things up—just by how we approached the task. We could have one person take notes and one person more concerned with time rather than having to focus on all of those tasks individually if we were separated.

g. Communication → Teamwork.

Aspect/Theme of Face-to-Face Medium	Effects
Natural rhythm and flow of conversation	Encouraged more cooperation/interaction
Reading/interpreting reactions of others	Less explicit effort required tending to group maintenance and socio-emotional issues
	More time for team to devote to task
Heightened sense of accountability of/to others	More agreeable towards others
	More willing to work in team environment
	Easier to recruit others into team environment

Table 29. Face-to-Face Impact on Teamwork

All comments indicated the face-to-face medium positively affected *Teamwork* through the availability of sensory information and feedback cues that simply helped

"bring things together." Specifically, the natural rhythm of the communicative exchanges was credited with making the task of working together run smoothly; participants felt encouraged to cooperate, brainstorm, and engage each other in conversation and interaction simply because they could. The added non-verbal feedback cues also provided more time for participants to focus on explicit communication about task-related issues while socio-emotional or group maintenance issues—moods, reactions, agreements—were worked through various non-verbal channels.

Finally, participants suggested that a heightened sense of accountability improved their efforts to foster teamwork amongst others, "calling people out" who weren't contributing to conversation because it was easier to sense who the group might be leaving behind during its efforts. Being accountable to others also made it easier for participants reach consensus, settle matters of procedure, and improved their willingness to work as a team at all, e.g.,

> …you'd be accountable—right there—there is no way you could just not say something because we would all be right here looking at you just sitting there looking up at the sky. We would know, so you couldn't drop out…it would have been weird if somebody just sat there and didn't contribute.

h. Communication → Task Focus.

Aspect/Theme of Face-to-Face Medium	Effects
Heightened sense of accountability	Social pressure to stay on task

Table 30. Face-to-Face Impact on Task Focus

All of the participant comments were quite pointed in their observations that the sense of accountability to others was crucial to the maintenance of social pressures that fostered *Task Focus*. Specifically, it was the sense of accountability *to others* that kept

participants from mentally wandering off topic or "drawing stick figures" on their notepads; e.g.,

> I think again because you've got that peer pressure being among the group, you know we all maintained focus. Nobody wanted to get up and go to the bathroom and get a drink or just talk randomly about life.

i. Communication → Synergy.

Aspect/Theme of Face-to-Face Medium	Effects
Heightened sense of accountability to others	More likely to integrate ideas of others
Reading/interpreting reactions of others	More productive; easier to achieve synergistic effects
Heightened sense of presence	More interesting and creative ideas produced
High verbal bandwidth	More total communication exchanged to help build synergy

Table 31. Face-to-Face Impact on Synergy

Again, the advantages conferred by available physical and sensory feedback cues in the face-to-face condition were common sentiments and accounted for 80 percent of participant comments. Examples include a heightened sense of accountability to others, making it more likely that participants would try creating any kind of synergy at all, e.g.,

> I think it makes you more sensitive towards the others and you let them express what they want; and then you're more prone to integrate that into your work process than in a different setting.

The ability to see and interpret the reactions of others was also critical to promoting synergy,

> Because on the phone you could say, "Yeah, that's a good response." In reality, you could be thinking, "What does he mean?" Getting to see everyone's reactions allowed us to be a more productive group.

Finally, participants indicated that the increased sense of presence had a positive, "tangible effect" on synergy that made more interesting and creative ideas surface, though precisely how this worked was often unclear.

Verbal bandwidth issues also contributed to perceptions of *Synergy* simply because *more* communicative activity was afforded within the groups than might be the case via other media. Participants described their face-to-face environments as easier, faster, and more conducive to brainstorming and idea exchange, ultimately improving the ideas around which synergy could be generated because more ideas per se could be expressed to work the problem.

j. Communication → Final Production/Resolution.

Aspect/Theme of Face-to-Face Medium	Effects
High verbal bandwidth	More options to incorporate into final solution
	Easier to support stream-of-consciousness thinking and exploration

Table 32. Face-to-Face Impact on Final Product/Resolution

Perceptions about the groups' final product closely echoed the sentiments of positive synergy due to the high verbal bandwidth of the face-to-face medium. Participants felt they could "get behind the issues" and discuss them in depth, as well as simply having a greater number of good choices to pick from when compiling inputs for their final product. Furthermore, the high verbal bandwidth of the medium enabled a more stream-of-consciousness-like discussion that produced not only more ideas, but

perceptually better ideas that ultimately improved the group's final product or final decision set.

k. Sidebar: Face-to-face.

The physical and sensory cues available face-to-face imply a greater *total* symbolic bandwidth that could also account for the results of the *Final Product/Resolution* and *Synergy* relationships. Indeed, participants did explicitly perceive the effects of both the amount of verbal information that could be exchanged face-to-face, and the presence of non-verbal and other sensory information in their discussions of *Synergy*. However, the effects of the medium on the *Final Product/Resolution* affinity were attributed fully to the depth and degree to which the information required to reach the final product could be explored and conveyed to others.

Based on the relational comments for the *Synergy* and *Final Product/Resolution* affinities, it was reasonable to conclude that the implicit effects of verbal bandwidth were perceived via increased throughput—the production and exchange of a greater number and greater variety of verbal symbolic codes. Such bandwidth advantages could also account for the abundance of comments indicating that face-to-face was simply a faster and easier means of communicating than either of the other media. The fact that this bandwidth component appeared in more than one relationship, but was also expressed as perceptually distinct from the medium's non-verbal characteristics, seemed to suggest it might be informative *not* to combine the implicit verbal bandwidth components with the explicit non-verbal bandwidth. Therefore, a separate verbal informational bandwidth component was added into the composite experience of the face-to-face medium as introduced at the start of this section (Subsection *1. Affinity Analysis*).

l. Communication → Influence.

Aspect/Theme of Face-to-Face Medium	Effects
Heightened sense of presence	Greater perceived influence of others
	Gestures, volume, and eye contact could generate influence over others
Reading/interpreting reactions of others	Passion or emotionality was influential
Heightened sense of accountability to others	Sense of participation engendered influence
Natural rhythm and flow of conversation	Easier to control/change course of conversation

Table 33. Face-to-Face Impact on Influence

The availability of non-verbal cues was universally perceived to improve or enhance perceptions and experiences of influence in the face-to-face condition. Within that particular set of issues, 53 percent of the participant discourses indicated that a sense of "presence" was influential in and of itself, attributing such effects to non-verbal cues such as facial expressions, animated hand gestures, posture, and body language, e.g.,

> I think there is something about humans and the body language that we use when we are talking face to face that makes everybody else defer to one person, kind of subconsciously. That one person is acting more confident in a given situation so you defer to that person, even very subtly, like looking at that person when some new topic comes up and cue them to input into the conversation.

Nearly as common (35 percent of the discourses) were sentiments that *how* things were said—how strongly or passionately—rather than *what* was said, proved influential face-to-face:

> …you could tell when someone very passionately wanted us to decide one way or another and I think that influenced the decision a lot more than it would have on the phone or the chat. It made me more sensitive to what they were thinking. For instance, let's say I didn't think he should be thrown out of school, but if someone really felt passionate about it, I would be more inclined to see it their way because of the amount of passion that they displayed.

A heightened sense of accountability was also responsible for generating influence within the face-to-face groups though it was not perceived as that common an effect (only 6 percent of the discourses). Specifically, participants reported that those who were obviously contributing or participating more often to the discussion were perceived as more influential.

The remaining discourses were expressed in terms of the ability to enter or guide the course and rhythm of the conversation. For instance, the speed of transmission and abundance of non-verbal information helped a particular group member maker her interests more immediate to the group and made it easier to insinuate herself into the group's efforts. As she recalled,

> …nothing got decided that I would be completely against. If anybody started going in a direction that I didn't think was going to be good for the assignment, I would be right there to say, "Well, don't you guys think we should think about this?" It was really easy to just chime in.

4. Summary Results

The *Communication* affinity analysis indicates that three issues or themes were explicitly relevant to participant experiences and perceptions of the face-to-face medium: availability of non-verbal physical and sensory feedback cues from others, common reference issues, and timekeeping issues. A fourth element, verbal bandwidth, emerged from inferences made about the ways the face-to-face medium affected other system affinities. An interesting finding was that timekeeping issues, though relevant to perceptions of the medium itself, did not play a part in shaping *any* of the relationships between the medium and other system affinities.

Verbal bandwidth was relevant to the medium's perceived effects on *Synergy* and the groups' final production or resolution; however, no other aspects of the medium affected the quality of the group's final outcome or final product. The ability to share a

common reference was also relevant in a small number of cases, specifically to the experiences and perceptions of *Group Roles* and *Logistics*. These results suggest that an ability to orient to a common reference point was important for determining how individuals worked together through the task and how they differentiated and compartmentalized their efforts to complete the task itself.

The most common aspect of the face-to-face medium that impacted all but one of the system affinities was the availability of non-verbal sensory and feedback cues. The face-to-face setting itself and the presence of these cues alone (rather than any intermediate effects they may have produced) played a part in the experiences of *Emotions* and *Group Establishment/Formation*. However, the four related but conceptually distinct intermediary effects produced by these cues were ultimately responsible for further shaping experiences and perceptions of other elements of the communicative context. The two most common of these effects were a heightened sense of accountability of others (or to others in the group) and the ability to read and interpret the reactions of others. The provision of non-verbal cues to provide a heightened sense of presence and regulatory cues that afforded a natural rhythm and flow of the conversation were also relevant to participant perceptions and experiences. However, these effects were not invoked as often during the interviews as impacting perceptions and experiences.

What is most interesting about the elements, themes, and mechanisms at work between the face-to-face medium and the rest of the system is that all the sentiments expressed were strongly and uniformly positive. Participants in this study clearly perceived and experienced a series of positive relationships between the face-to-face medium and every other relevant aspect of the communicative context. The following figure provides a graphical summary of the preceding discussions; it depicts the

mechanisms for effect of the face-to-face medium on each system affinity using the data provided from the preceding summary tables. Green affinity boxes indicate positive experiences or perceptions. Color-coding has been added to indicate which face-to-face issues or themes were perceived as casual mechanisms for the relationships between affinities and perceived effects on the affinities. These instances of color coding are not meant to be evaluative (red does not mean "bad"); only to provide a gross appreciation of the different mechanisms at work within the face-to-face structured group experiences.

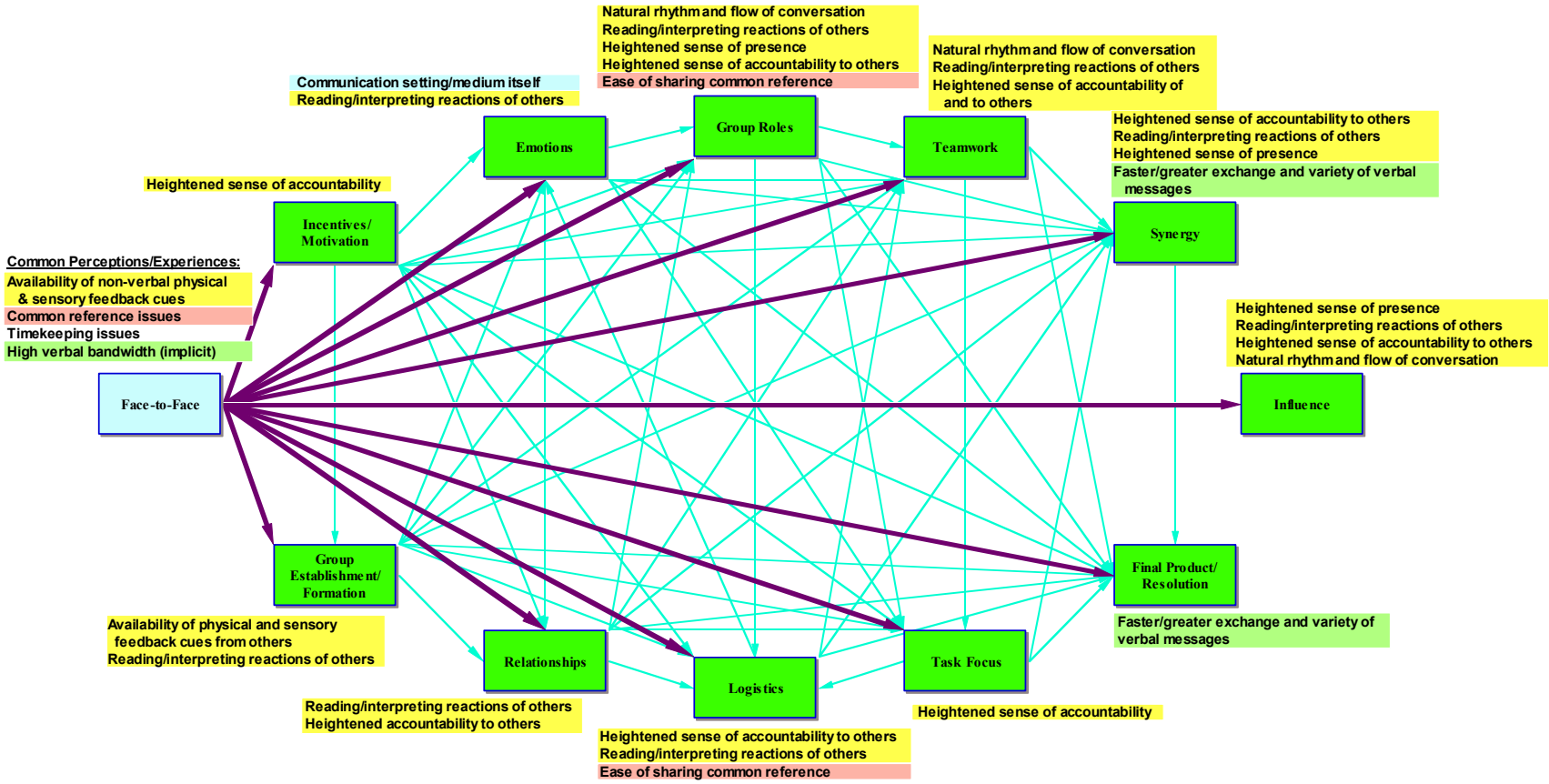


Figure 13. Elements of Face-to-Face Responsible for Perceived and Experienced Relationship

C. COMMUNICATION: VOICE CONFERENCE

1. Affinity Analysis

Common perception/experience	Result
Physical and sensory feedback cues (primarily versus face-to-face)	Altered perceptions of self and others; reduced sense of accountability to and from others
	Sense of social insulation; altered individual expressivity in group
	Limited ability to gauge reactions of others
	Altered rhythm of conversation
Quasi-full duplex operation	Imposed structure to conversation
	Hampered individual communication
	Improved group communication, quality of inputs, and pressure to participate
Foreign hardware/interface design	Sense of novelty or curiosity
	Took time to work through unfamiliarity
Timekeeping issues	Use of timekeeping capabilities unintentionally provided with interface or recording devices
Common reference issues	Difficulty maintaining collective memory
	Difficulty coordinating efforts
Verbal bandwidth (primarily versus chat)	Easier to get more/complex ideas across

Table 34. Voice Conference Medium Affinity Analysis

The voice conference's *lack* of non-verbal sensory and feedback cues as compared to face-to-face was the most common (30 percent of the comments) sentiment about the medium expressed during the interviews. Such deficiencies affected how members perceived themselves and others in terms similar to accountability. For example, participants reported feeling socially insulated and experienced greater self-confidence and freedom of expression, e.g.,

> You can't see people's body language. Maybe you are the kind of person who takes a while to communicate so you might say something wrong and

> people will give you a look and you won't continue. But on the phone you wouldn't hear that or see that. Or it could be the way you deliver it; maybe you are not confident in the way you are delivering it and therefore what you are saying is not given a lot of attention. But on the phone, someone can't see you aren't confident.

The lack of non-verbal cues also limited the ability to gauge others' reactions, thus making it difficult to tailor messages or conversational strategies based on changing group dynamics, e.g.,

> If a person was saying something and I disagreed with them, I couldn't tell how they reacted. If you're looking at someone's face, you can determine what their emotions or what kind of feelings they have towards you. I might be able to tell more on their face if they were annoyed or not, so that affected what I would say and not say.

Localization of a specific speaker or differentiation between speakers was also difficult without any visual cues; participants often lost track of their implicit sense of conversational organization based on who submitted what point for discussion and who was to be addressed next. Similarly, participants found it difficult to follow or enact conversational rules of engagement because they had no eye contact or other physical cues to keep from talking over one another.

Conversational rhythm and organizational issues were also problematic due to the "quasi-full duplex" implementation of the speakerphones. Specifically, two or more could speak at the same time and a person not speaking could hear both sides of the conversation. However, as is common in many implementations of a voice conferencing capability, the active microphone for those who were speaking muted the built-in speaker to avoid feedback. Participants were thus unable to hear anyone else until they finished speaking. This particular aspect of the medium was seemingly exacerbated by the lack of non-verbal cues to help regulate conversational flow was also quite commonly cited (27 percent of the respondent comments) during the interviews.

Individually, participants indicated they were sensitive to the operation of the speaker-phones by curtailing their inputs or being less forceful in voicing their opinions because they never knew if they were speaking over others and did not wish to seem domineering. These effects translated into group-level benefits because hearing the sound drop out while speaking fostered the development of a round-robin or turn-taking conversational style that encouraged all group members not speak over each other. This imposed conversational order improved input quality because participants had more time to think between speakers while waiting their turn. Members of the voice conference group also experienced implicit pressure to participate because the conversational rhythm became especially awkward during long pauses after so much effort was expended to accommodate others' turn-taking opportunities to contribute to the discussion.

Less frequently cited (only 15 percent of the comments) were reactions to the hardware interface for the voice conference capability itself, mostly due to the styling of the speakerphone handset. Participants perceived the phones as a novelty and were either intrigued or disconcerted by their unconventional design. However, these initial reactions faded quickly once group began.

Common reference and timekeeping issues accounted for another 15 percent of the comments. Much as the face-to-face groups had done, voice conference participants used paper and pen to organize their thoughts. Yet, they found it difficult not to share a *common* reference while working; effort was expended simply to "catch others up" on a particular point documented by only one group member. It was also interesting to note that members of one of the voice conferencing groups experienced frustration at having no sense of time or way to get others to respond to time pressures; yet members of the other group admitted to using the readouts on the digital recorders or the call duration display on the speakerphone handsets to keep track of time.

Though accounting for a relatively small percentage of the total discourses, issues akin to verbal bandwidth were also expressed. Sentiments articulating these bandwidth issues commonly described the medium's high verbal "throughput," especially compared to chat, e.g.,

> Most people can't type as fast as they can think…They might have this extensive thought and they were going to back it up with all their reasoning—and all they are going to type is, "I agree." On the phones, they'd be able to say something like, "Oh yes, I think this, this and this and this is why I think it."…I think we were able to get more information across on the phones.

2. Perceptions and Experiences of Influence

Common perception/experience
Influence strategies: rational persuasion and consultation/idea support
Guiding/pacing group activity and effort
Implicit influence: majority/conformity
Individual characteristics

Table 35. Influence Affinity Analysis for the Voice Conference Medium

Specific strategies of interpersonal influence seemed the most common experience for voice conference participants. Forty one percent of all affinity-specific comments centered on the quality or persuasiveness of the arguments presented, or on a particular group member's efforts to solicit ideas from others. These perceptual results mirrored the behavioral indices of influence in that *Rationality/Rational Persuasion* and *Consultation/Idea Support* messages were the most commonly enacted of all the measured influence message types.

Nearly as common (37 percent) were perceptions of procedural influence, those who paced, guided, or directed the activity of the group as a whole. Such individuals exercised their influence through speed, volume, frequency, or urgency of their voice, or allowed the group to digress through relevant asides without losing the "big picture."

Procedural influence was helped the group move or orient towards a specific outcome rather than resolve matters of fact, e.g.,

> She kept track of what we had said and if something didn't make sense at all, she'd point it out and say, "This doesn't make sense. We said this earlier but this contradicts this"...She would never ask, "White or black?" It wasn't like that. We would go through the steps that she wanted us to go through as a double check.

Of the remaining comments relevant to influence, half centered on implicit or majority forces that impacted individual decision making, i.e., decisions that fell in line with the majority position; as well as participation in group effort—no one wanted to be the only one who strayed off task or did not contribute. The other half centered on influence as a function of individual characteristics. Perceptions of intelligence as well as demeanor commonly proved to enhance or detract from the perceived influence of others.

3. Affinity/System Relationships

a. Communication → Incentives/Motivation.

Aspect/Theme of Voice Conference Medium	Effects
Lack of accountability of others	Inability to gauge motivation levels of others
	Inability to pick out individual "slackers" from others in group
Availability of call timer	Timer was motivating for task completion

Table 36. Voice Conference Impact on Incentives/Motivation

All but one of the participant responses indicated that the lack of sensory and feedback cues in the voice conference reduced the sense of social accountability, thus limiting one's ability to gauge others' incentives for task completion or active participation; e.g., others may have been doing nothing, "looking out the window," or "doodling on their notepads" rather than being actively involved in the group's efforts.

Due to difficulties localizing a particular speaker, participants also could not easily ascertain who to turn to (and who to tune out) amongst the other group members because they could not tell who was speaking at any given time. The only other recorded effect was a result of the small LCD display that indicated the call's duration. For at least one individual, making the passage of time explicit was motivating in and of itself.

b. Communication → Group Establishment/Formation.

Aspect/Theme of Voice Conference Medium	Effects
Limited ability to gauge reactions of others	Less sense of personality from others
	Inability to form deeper connections to others
Lack of accountability of others	Inability to determine who was speaking
	Not part of a cohesive group of real "others"
Imposed structure/rhythm of conversation	Never developed beyond impersonal, business-like atmosphere

Table 37. Voice Conference Impact on Group Establishment/Formation

Deficiencies in sensory and feedback cues comprised half the respondents' comments. Participants indicated they felt less "personality" from others and were unable to develop strong connections without facial expressions and body language to read. Lack of accountability also decreased the sense that the voice conferencing groups were composed of distinct and "real" others because participants could not accurately match voices with people.

Equally as common were the effects of the conversational structure and rhythm that the voice conference imposed. Because participants were forced to take turns rather than interrupting or overlapping each other, experiences within the group were quite congenial and professional. However, feelings about the voice conference groups

themselves never seemed to evolve past a utilitarian and business-like collection of individuals.

c. Communication → Emotions.

Aspect/Theme of Voice Conference Medium	Effects
Limited ability to gauge reactions of others	Inability to interpret emotional states of others BUT, was still better than chat
Communication setting/using medium itself	Anxiety working through medium

Table 38. Voice Conference Impact on Emotions

The most common perceptions that were expressed during the interviews concerned the varying efficacy of the voice conference to afford accurate interpretation or attribution of others' emotional responses and conditions. Lack of body language or eye contact made it difficult for participants to tell exactly what others were feeling, but at least vocal tone—that was unavailable through chat—provided some clues as to the emotional responses of others, i.e., whether they were earnest, joking, hesitant, or confident. A less common experience still accounted for slightly more than a third of all responses and concerned an emotional reaction to the medium itself. Participants indicated they were anxious about working over the phones either because they had never done so before, or because the experience itself produced anxiety and frustration.

d. Communication → Relationships.

Aspect/Theme of Voice Conference Medium	Effects
Lack of accountability of/to others	Deeper connections not established between group members
	Disconnection/depersonalization; others are not "real people"
	Total dependence on tone of voice to determine relational experiences with others
	Reduced inhibitions
Limited ability to gauge reactions of others	Less willing to compromise/faster to disagree

Table 39. Voice Conference Impact on Relationships

All of the participants attributed the medium's effects on relationships to variations or deficiencies in physical and sensory cues. Similar to observations about *Group Establishment/ Formation*, participants felt their interpersonal relations were not particularly deep—other group members were not "real people" but simply "voices coming out of a little box." The lack of localization cues also made it harder to determine who was speaking, thereby further reinforcing perceptions of disconnection *between* others because it was difficult to be accountable *to* others.

Participants further emphasized that without a good sense of who was relating to whom amongst the group, tone voice was solely responsible for determining relational behaviors. Yet, with only inflections or vocal tone governing behavior, participants felt less inhibited about how they needed to treat others. Such insular effects were liberating in a personal sense; however, because there was also no salient feedback or immediate relational consequences for one's words or actions, participants also reported that they

tended to disagree more and were somewhat less willing to compromise during their discussions than they might have been face-to-face.

e. Communication → Group Roles.

Aspect/Theme of Voice Conference Medium	Effects
Lack of sensory/feedback cues (per se)	Limited sense of presence inhibited role emergence/acceptance
Limited ability to gauge reactions of others	Inability to differentiate roles others wished to establish/assert
Lack of accountability to others	Equalized status differentials that establish certain role structures
Imposed structure/rhythm of conversation	Necessitated leader/manager type roles to regulate conversation

Table 40. Voice Conference Impact on Group Roles

Participants were equally divided in how they experienced the effects of the voice conference on group roles; half had attributed the effects to a lack of sensory and feedback cues. The most common perception was that the lack of non-verbal cues limited the sense of presence necessary to establish certain roles within the group, e.g.,

> I think it was hard for a leadership position to be established over the phone because peoples' presence weren't actually felt there. Like I was saying earlier about someone having a presence that can be felt—it's hard to feel that just from their voice over the phone.

Interview comments also indicated that reactions and feedback to the way the conversations unfolded were normally used to differentiate emergent role behaviors. Because such cues were limited, participants were unable to recognize who might have been trying to assume leadership roles. However, individual characteristics that were otherwise influential for role establishment, such as age or experience, were also not translated through the medium. Thus, the lack of accountability to others on the basis of

such a priori concerns removed some of the barriers that might have stood in the way of developing roles, for instance,

> I think I would have been slightly more submissive to Samantha because of the whole culture and age issue. Out of respect I may have said, "Okay, she's going to be the leader and I'm the follower." Being on the phone…I can be as aggressive as I need to without letting her age get in the way.

Paradoxically, the other half of the comments indicated that the imposed structure and rhythm of the voice conference actually *necessitated* at least one leader or manager-type role to help guide the group through the artificial conversational flow. As one participant recalled,

> Face to face, I might've just thought, "You're kind of pompous,"...no one wants to be told what to do unless they have to be told what to do. [Over the phones] it was a necessity; otherwise, we had nothing to go on…we'd be shooting in the dark and hoping people would react until we developed a sense of the roles.

f. Communication → Logistics.

Aspect/Theme of Voice Conference Medium	Effects
Lack of common reference	Inefficient: logistical responsibilities shifted to all group members
	Difficulty moving group efforts forward and keeping everyone on same page

Table 41. Voice Conference Impact on Logistics

All of the participants indicated that establishing a direction for the groups' efforts, keeping those efforts moving, and marking off progress was more of a challenge without support for a common reference. Managing work flow or progress checks had to be shared by all group members rather than having a single person documenting the actions of the entire group on a shared notepad. Group effort was also inefficient;

frequent back-pedaling was required to ensure everyone understood what progress had been made or what decisions were finalized; e.g.,

> Keeping up was difficult at times—catching somebody up who lost track along the way. I know I did once, "What was number 6? What was number 7?" That was one thing that wouldn't have happened if we were in person because I would have just peeked over my shoulder and seen what they wrote. We lost time trying to catch people up on the list.

g. Communication → Teamwork.

Aspect/Theme of Voice Conference Medium	Effects
Limited ability to gauge reactions of others	Limited ability to determine how well the team is working together (no "sense" of teamwork)
Lack of accountability to others	Limited sense of presence/connection to others
	Feeling less like group is "in it together"
Imposed structure/rhythm of conversation	Limited ability to work together/speak in simultaneous fashion
	Increased sense of utilitarian, business-like environment
Lack of common reference	Difficulty coordinating collaborative efforts and thought
	Easier to compartmentalize tasks rather than work as a team

Table 42. Voice Conference Impact on Teamwork

The most resoundingly common experience of teamwork (over 55 percent of the participant comments) was expressed in terms of a lack of sensory information and feedback cues. The lack of such cues reduced one's ability to gauge *how successfully* the team was working together because participants could not see how others were reacting to them as they tried to work together to complete the task. Limited accountability from and to others also entrenched feelings of detachment and perceptions that others were less than "real people" with whom only limited connections could be made, e.g.,

> …facial expression could sometimes help with feeling like you can relate to someone better. So with that not there, it made us less likely to feel like we were in this together, to feel that connection.

The remaining discourses were evenly split. First, the conversational structure and rhythm influenced teamwork simply because the conversations themselves required conscious effort to maintain. Though participants couldn't simply speak when they wanted to do, the overhead and effort required to mutually negotiate and enact the rules of the conversation did help foster an air of cooperation and business-like efficiency. Second, the lack of support for a common reference hindered teamwork because participants could not easily share information; therefore, it was easier to sub-divide the tasks rather than coordinate everyone's efforts in a collective fashion, i.e., "…you just do that part and I'll just do this part."

h. Communication → Task Focus.

Aspect/Theme of Voice Conference Medium	Effects
Lack of accountability to others	Boredom; easy to lose focus
	More likely to multi-task
Lack of sensory/feedback cues	Less social distraction
Imposed structure/rhythm of conversation	Fewer parallel/side-tracking conversations
	Lose track of what others are saying "waiting for your turn"

Table 43. Voice Conference Impact on Task Focus

Like the experiences of *Group Roles*, sentiment concerning the relationship between the voice conference and *Task Focus* were evenly split between a lack of sensory and feedback cues and the imposed conversational rhythm and structure. Regarding the lack of non-verbal cues, one of the more common sentiments was a

negative effect due to a reduced sense of accountability to others, i.e., participants could focus on other topics, "space out," or even doodle on their notepads without fear of seeming rude or inattentive. Yet, at least one individual found the lack of physical stimuli in the voice conference condition helpful for task focus:

> When we were on the phone we were more task oriented…But if we were in person, we might get distracted, side-tracked, start talking about different things and maybe comment on someone's shoes and then the conversation turns to, "Oh yes, I got these there and there," or something like that.

The imposed conversational structure had the potential for the opposite effect on *Task Focus*. Specifically, the effort and attention required for the turn-taking conversational style,

> …definitely kept us more focused on the task because people have to be selective…You have a short amount of time to say what you want to say and then give somebody else the chance to talk…so you would want to be as productive as possible and contribute as much as possible in a short amount of time.

Because it was difficult for two people to speak at once, participants also engaged in fewer parallel or side-tracking conversations. However, at least one person found it more difficult to focus due to the conversational rhythm the voice conference imposed. In this case, the participant admitted she was not truly listening to others, but merely waiting for her turn to say something she had been thinking about the entire time.

i. Communication → Synergy.

Aspect/Theme of Voice Conference Medium	Effects
Imposed structure/rhythm of conversation	Interrupted creative "stream-of-consciousness"
	Less opportunity to build on or integrate ideas of others

Table 44. Voice Conference Impact on Synergy

The effects of voice conference on synergy were uniformly described as a function of the imposed structure and rhythm of the conversations. Negative effects included interruptions of the group's stream-of-consciousness that would have (presumably) led to synergy; for example,

> Because you have to wait until the next person talks—you can't just jump right in and say, "Wait a minute. I had brilliant idea just now." Once you do that, you have to wait for all the other people to listen to you as well before they can say anything…if the conversation gets overlapping on the phone, nobody has any idea what's going on anymore.

The segmented conversational flow also provided less opportunity to frame or integrate one's ideas with those of another—one of the defining characteristics of synergy in this study; e.g.,

> You weren't able to think things through fully…You had your own segment and you didn't have that much time to think about how you were going to build on somebody else's idea. It was pretty much just the first thing that came to mind.

j. Communication → Final Production/Resolution.

Aspect/Theme of Voice Conference Medium	Effects
Imposed structure/rhythm of conversation	Reduced quality: less time to fully express or discuss ideas
	Improved quality: more orderly communication process

Table 45. Voice Conference Impact on Final Product/Resolution

The effects of the voice conference on the *Final Product/Resolution* affinity were perceived simply as one of two extremes. Half the participants expressed a negative relationship due to the imposed conversational structure and rhythm—the voice conference simply "got in the way" of the group's efforts to reach their final product

because they were less able to fully express their ideas during the segmented conversations. The other half perceived a positive relationship because the imposed conversational structure and rhythm provided a more efficient and orderly path for reaching the final product; quality of the final product was improved because time and effort was not wasted on chaotic or contentious behaviors within the group.

k. Communication → Influence.

Aspect/Theme of Voice Conference Medium	Effects
Variable sensory/feedback cues	Tone of voice was influential (especially as compared to chat)
	Feelings of detachment/inability to influence others (especially compared to face-to-face)
Imposed structure/rhythm of conversation	More time to craft persuasive messages
	More utilitarian conversations—less overall influence expressed during group activities

Table 46. Voice Conference Impact on Influence

The largest proportion of comments on the subject (60 percent) indicated that participants perceived the effects of the voice conference in terms of sensory and feedback cues relative to the capabilities of the other two media. For instance, because the voice conference allowed the conveyance of vocal tone and inflection, influence was experienced based on how confidently, how strongly, or how emotionally someone *sounded* in their opinions. Yet, the lack of additional cues beyond tone of voice proved a hindrance to exerting influence on others because of the oft-cited issues of detachment and depersonalization that removed the interpersonal, other-oriented aspect of influence from the equation, e.g.,

> I would have felt like there's nothing I can say to convince anybody about anything because they're not going to hear me or they won't know that it's important to me because they won't know by just the sound of my voice.

The remaining effects were expressed as result of the imposed conversational structure and rhythm. First, the segmented conversations provided additional opportunities for participants to craft more a more persuasive and influential message because they had to wait their turn for others to finish speaking. Second, the imposed conversational rules limited opportunities for any one person to speak in general, and thus drove the conversation itself towards more utilitarian ends. Consequently, less influence was enacted within the groups as a whole because there was less time to devote to any non-task related communication including interpersonal influence, e.g.,

> …you aren't able to voice everything you want to voice because you had a time limit…and you didn't want to talk over some people, you wanted to get the task done first. That was the first priority rather than having your voice heard.

4. Summary Results

The *Communication* affinity analysis suggests that six different issues or themes were explicitly relevant to the study participants' experiences and perceptions of the voice conference capability: physical and sensory feedback cues, quasi-full duplex operation, foreign hardware and interface design, verbal bandwidth, common reference issues, and timekeeping issues. Those issues and their associated mechanisms for effect on other system affinities are summarized in Figure 14. Red affinities indicate predominantly negative experiences or perceptions; yellow indicates ambivalence—either very positive or very negative experiences and perceptions depending on the circumstances or participants' interpretations.

Of note is the fact that the voice conference was perceived as having an overall negative effect on the entire system of experience during the study; strongly negative

outcomes and perceptions were produced in six of the ten system affinities. There were also no resoundingly positive effects at all as was observed in the face-to-face condition. Instead, the other four other system affinities, as well as the participants' experience of *Influence*, varied between extremes.

As indicated in Figure 14, the effects of variable non-verbal physical and sensory feedback cues (yellow) and those of the imposed structure and rhythm of the conversations (light green) were the most commonly cited causes of the medium's perceived impact within the system. Specifically, non-verbal cues and their effects played a part in the perceptions and experiences of seven of the ten affinities as well as experiences of influence; conversational structure and rhythm affected six of the ten as well as influence. However, conversational rhythm was the only aspect of the voice conference to impact experiences and perceptions of *Synergy* and the *Final Production/Resolution* affinity, suggesting that departures from the flow of normal conversation had the potential to derail the quality and completion of the group's final product regardless of any other media effects experienced during the production of that product.

The remaining aspects of the voice conference were cited far less frequently (only once or twice apiece) during the interviews. Of those remaining issues, lack of a common reference was perceived as solely responsible for the negative outcomes associated with *Logistics*. Perceptions of the voice conference's increased verbal bandwidth capabilities (as compared to chat) did not figure into the participants' discussions of how the medium affected other system affinities at all, even though it was perceived as a relevant aspect of the medium itself. Similarly, the hardware and interface design that supported the voice conference did not produce any tangible or perceived effects on the remainder of the system of experience during the study.

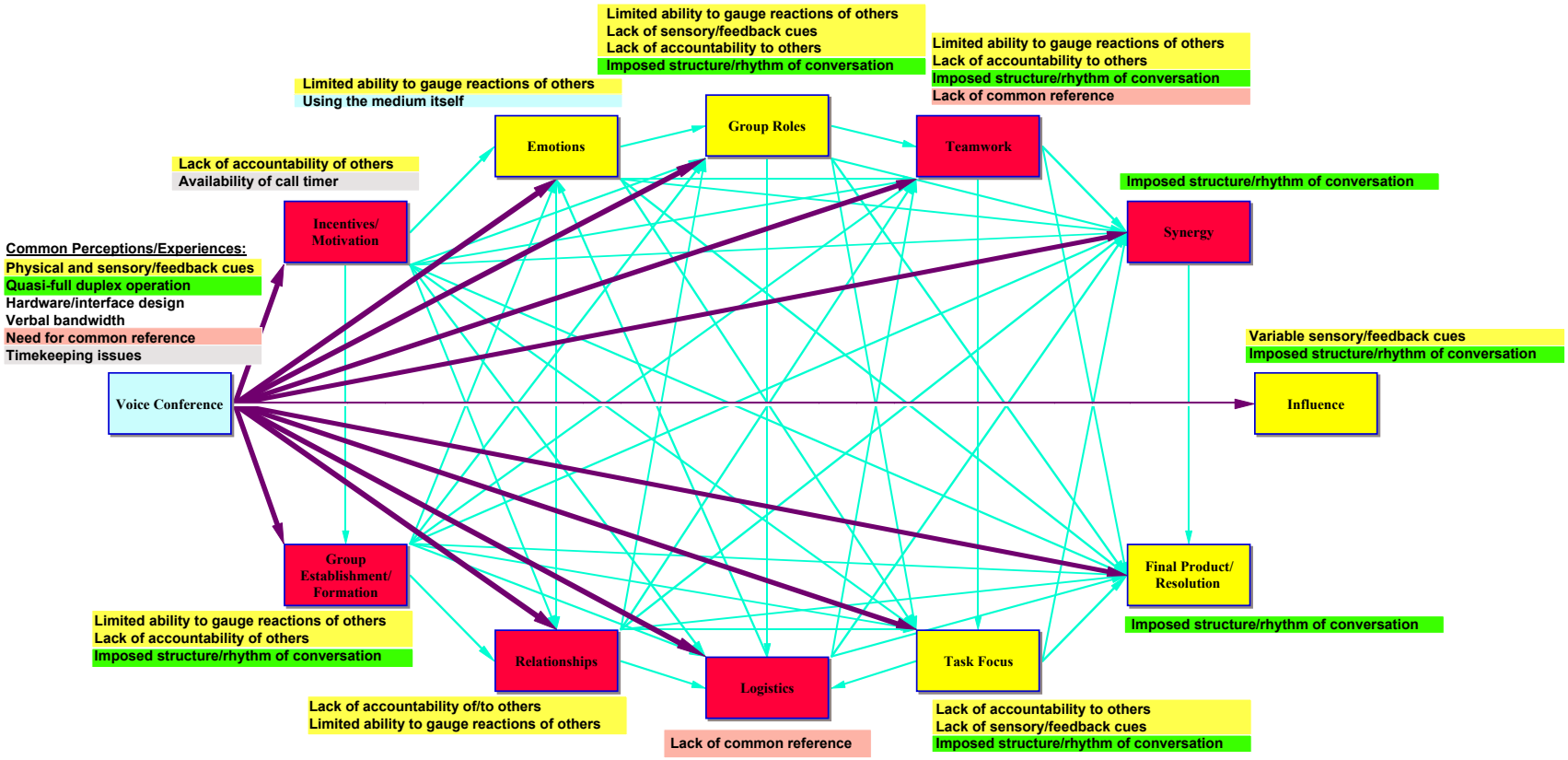


Figure 14. Elements of Voice Conference Responsible for Perceived and Experienced Relationships

D. COMMUNICATION: CHAT

1. Affinity Analysis

Common perception/experience	Result
Verbal bandwidth limitations	Slower communicative exchanges
	Less expressive/truncated messages
	Reduced sense of organization and continuity of conversation
	More time to compose accurate messages
	More time to interpret what others said
Simultaneity of multiple responses	Difficulty developing and maintaining organization and continuity of conversation
	Need for explicit means to establish context of individual messages
	Fewer social rules to manage conversation
	More brainstorming-style input
	Fewer barriers to contribution
Common reference issues	Difficulty maintaining collective memory
	Difficulty coordinating efforts
	Increased effort verifying actions/discussions
Conversational trace	Served as collective memory
	Served as implicit method of integration or reflection
Timekeeping issues	Need to have time explicit to gauge progress
	Using time-stamp to gauge participation
Lack of non-verbal sensory and feedback cues from others	Difficulty gauging reactions of others
	Reduced sense of accountability of/to others
	Unsure how to handle lulls in conversation
Presentation	Effort and concern for impression management
Hardware/interface design	Took time to work through unfamiliarity

Table 47. Chat Medium Affinity Analysis

Experiences and perceptions of the chat capability were the most complex of any media; eight often closely related themes emerged from 63 individual discourses culled from participant interviews. The two most common perceptions of the chat medium were its verbal bandwidth and support for multiple simultaneous responses; each of these issues accounted for 19 percent apiece of the total discourses. Bandwidth limitations were uniformly expressed in terms of reduction in communicative speed on the sending side (taking longer to type than to talk) and receiving side (waiting for others to read a message and waiting again for a response).

The added time and overhead to render even short messages resulted in reduced expressiveness or truncated thoughts and ideas because participants were trying to "cut down" their messages so that they could be typed out before the group moved on to another topic. Yet because the added time required to type and read messages was common across all participants, more time could be taken to render a particularly thoughtful message, and the more time could be devoted to interpreting (or re-reading) the messages of others. Finally, particularly slow typists made it difficult to maintain conversational organization and continuity because their responses were entered into the discussion long after the relevant points had been made, e.g.,

> …by the time they finished typing feedback to something that was way up in the conversation, everyone else had already spoken and moved on. It was difficult to reconcile what they were just now saying with what we already thought had been done.

The chat medium also allowed several individuals to express their thoughts or respond simultaneously, further contributing to difficulties maintaining conversational continuity because the context for a particular response, especially who was responding to whom, was not always clear; nor was it easy to tell in which direction the discussion was moving if more than one response arrived expressing conflicting or contradictory

sentiments. Yet, without any restrictions over who could speak next, chat necessitated fewer social rules to govern communication, e.g.,

> I could just put one idea down and immediately start typing the next. In the end, even if the ideas were less organized, we'd have more of them because people would be thinking and typing at the same time.

Though the chat medium provided a shared record of a group's efforts and discussion, participants bemoaning a lack resources or common reference *outside* of the medium were nearly as common as the sentiments expressed above (16 percent of the total). For instance, participants had a hard time deciding when everyone had agreed on a particular issue or what parts of the task still needed to be addressed because the chat log only contained the exchanges themselves but no meta-information about what those exchanges addressed. A great deal of time and efficiency was also lost to searching the chat log in order to verify or validate the group's efforts and results.

The next most commonly expressed perceptions of the chat medium accounted for a third of all the participant discourses and were evenly divided between three issues. First, because the chat log was a virtual trace of the entire conversational exchange, participants assumed the rationale for their actions or decisions was implicit in the log itself so they spent less time integrating or reflecting on the implications of their discussions. Second, despite the time stamps on each message and clock provided as part of the laptops' operating system, participants had a hard time gauging their group's progress, determining how much urgency they should place on keeping things moving, or judging how participative other members were based on frequency of input. Third, the lack of non-verbal cues in the chat resulted in several distinctly negative outcomes similar to those observed in the voice conference condition. Specifically, participants had difficulties gauging and interpreting the reactions of others, felt a decreased sense of accountability to and from others in the group because there was no way to know what

was "going on behind the keyboard," and had troubles interpreting lulls in the conversation because it was never clear whether a particular message of was understood, if others didn't want to acknowledge the message, or whether the group should keep moving despite the pause.

The last and least commonly expressed perceptions of the chat medium concerned the impressions participants created and conveyed to others and the hardware and interface supporting the chat itself. In particular, participants were sensitive to their own and others' proper spelling and grammar use, taking time to correct such errors before committing their comment to the discussion. In addition, a small number of the participants had never used laptop before and found the keyboard and mouse-pad placement awkward and unfamiliar. Another few participants were struck by the differences between Skype and the interfaces of more popular instant messaging clients (e.g., AOL, MSN, Yahoo!) that occupied far less space on the screen. Yet in both instances, participants quickly worked through any such hesitation or misgivings.

2. Perceptions and Experiences of Influence

Common perception/experience
Influence strategies: rational persuasion and consultation/idea support
Guiding or pacing group activity and focus
Individual characteristics
Passion and conviction of others

Table 48. Influence Affinity Analysis for the Chat Medium

Mirroring the voice conference results, *Influence* during chat was most commonly (half of all comments) experienced in terms of specific influence messages or strategies, the most successful of which were based on sound reasoning or quality of analogy, or solicitations of ideas and opinions such that others might re-evaluate their own position

as result of the inquiry itself. Again, these findings provide perceptual verification of the behavioral findings in that *Rationality/Rational Persuasion* and *Consultation/Idea Support* were the most common of the measured influence message types.

The next most common experiences of influence were evenly split (22 percent apiece); first, from those who affected the pace or flow of the group's activity in an effort to reframe or reorient the group's collective attention and perspective. Such individuals were influential in helping the group organize its own thoughts or agenda, move on to another topic in the face of an impasse, or making sure everyone had a common understanding of the issues, e.g.,

> She definitely had a part in the group where she would take things that other people said and say, "You're right, and you're saying this," and everyone would say, "*Ohhhhhh*." But she didn't have strong points that she pushed."

Second, perceptions of influence were based on individual characteristics such as apparent knowledge, intelligence, or experience as demonstrated by academic status.

The remaining comments suggested that individual influence was a function of the apparent passion, investment, or conviction of another person's beliefs and positions—an interesting finding given that the chat produced less expressive messages and provided no non-verbal cues to indicate how strongly someone *intended* to express a particular message. Such perceptions of influence were not based on the quality of the argument or the soundness of the reasoning, instead, influence was perceived when,

> …some people made it clear when they said, "I really think it should be B." They seemed very adamant about it and I would think, "Okay I'll go along with that." So their own investment was influential.

3. Affinity/System Relationships

a. Communication → Incentives/Motivation.

Aspect/Theme of Chat Medium	Effects
Reduced sense of accountability of/to others	Can't get a sense of other's motivation levels to participate at all
	No sense of how strong others' incentives were to contribute meaningfully to task
	No social pressure to perform
Time-stamp on messages	Explicit sense of time was motivating depending on individual
Verbal bandwidth limitations	Increased time and effort to finish the task was de-motivating
Simultaneity of multiple responses	"Evened playing field"—no one could dominate conversation

Table 49. Chat Impact on Incentives/Motivation

The lack of non-verbal sensory and feedback cues was commonly cited as responsible for this particular relationship and accounted for half of all the discourses. Without a sense that others were accountable to the group, participants had no idea how involved other members were with the group's efforts—whether they were surfing the Internet, thinking about what was on the screen, typing a response, or just intermittently contributing a random thought. Participants also couldn't tell whether others were motivated enough to contribute something meaningful or were simply acquiescing to the task, i.e., "…coming up with answers they wouldn't follow through with in real life." Finally, the lack of accountability *to others* did not make for a particularly motivating environment because there was no sense of social pressure to perform.

Thirty percent of the comments indicated that timekeeping issues such as messages time stamps were motivating in and of themselves assuming that an

individual's personality was responsive to such pressures. The remaining discourses were evenly divided; participants felt that limited verbal bandwidth was de-motivating because it hampered the group's ability to finish the task—though which *particular* aspects or effects of the bandwidth limitations were responsible for these effects was not explicitly articulated. Contrarily, the simultaneity of multiple responses was motivating because it helped "even the playing field," making it difficult for one person to dominate the conversation or stop others from contributing.

b. Communication → Group Establishment/Formation.

Aspect/Theme of Chat Medium	Effects
Reduced sense of accountability of/to others	Feelings of detachment and disconnection
	No sense of "individual others"
	Group was an informational experience, not an interpersonal experience

Table 50. Chat Impact on Group Establishment/Formation

All participants described the impact of the chat on perceptions about the way the group was formed or established in terms of reduced accountability. Common sentiments were of disconnection, depersonalization, and detachment; sentiments reinforced by the fact that as someone's name appeared less frequently on the screen, it seemed easy to forget they were part of the group at all. In fact, the notion of "individual others" seemed to disappear entirely, e.g.,

> …all the other people blend together into this one thing that's just getting me information. That's all it is, just information about what the other people are saying to me…it might be like you're reading a book and you say, "Ah, this person agrees with this, this, and this." But what were they thinking about it? How did they feel about it? Are they really interested? Are they passionate about it…it just doesn't seem quite as personal.

c. Communication → Emotions.

Aspect/Theme of Chat Medium	Effects
Less expressive/truncated messages	Reduced emotional expression in messages
	More emphasis on substance ("utilitarian")
	Less extreme emotional reactions or confrontations with others
	Frustration with bandwidth limitations themselves
Inability to gauge others' reactions	Limited ability to interpret emotional responses
	Insulation from negative judgments of others
Lack of non-verbal sensory and feedback cues	No ability to discern emotional intentions behind messages
Reduced sense of accountability of others	Frustration during disagreements and conversational lulls
Simultaneity of multiple responses	Frustration keeping up with lack of conversational organization and continuity

Table 51. Chat Impact on Emotions

Bandwidth limitations were primarily cited as responsible for participants' emotional experiences in this study and accounted for over 62 percent of the discourses. Participants consistently referred to chat as a "non-emotional form of communication," one that necessitated a utilitarian concentration on substance because the time and effort required to get a basic point across didn't leave time to make underlying emotional issues explicit in the text (even when strong emotions or reactions seemed warranted). These bandwidth limitations helped insulate others from emotional reactions and reprisals, but were themselves a source of frustration, e.g.,

> It made it to where you're not mad at anyone else, you don't get into big fights, you're just waiting for everyone's opinions and taking it into consideration...the only emotions you have were frustration with the process.

Another factor contributing to emotional issues during chat was the lack of non-verbal sensory and feedback cues from others, though this particular aspect of the medium was mentioned much less often (only 23 percent of the participant comments). Participants had no explicit information to interpret how others reacted to their own input and therefore no way to infer emotional states of others; however, the lack of reactionary cues did produce a sense of ease because participants were insulated from judgmental or disapproving non-verbal responses. Similarly, the chat provided no non-verbal cues to indicate emotional *intentions* behind someone else's message, further reducing the degree to which emotions could be interpreted or divined. Finally, the reduced sense of accountability during disagreements produced additional frustration because participants had no sense of how to proceed or what others were doing at the time, e.g.,

> …whenever we'd disagree, it would just be this awkward pause and I'd be thinking, "Well, what is she thinking? Does she disagree or something?"

The few remaining comments indicated participants were exceedingly frustrated by the simultaneous display of multiple responses because they couldn't "stay on top of the conversation" or "keep up with what everyone else was saying." Participants who were familiar with chat and its conversational style were also frustrated by those who seemed to operate under the assumption that the chat was a turn-based discussion, presuming that when,

> …they would look down to type and then enter their response that no one else had said something while they were typing. They'd miss things and the conversation would be stopped because—well, we already did that a second ago!

d. Communication → Relationships.

Aspect/Theme of Chat Medium	Effects
Lack of non-verbal sensory and feedback cues	More utilitarian, business-like relations
Inability to gauge others' reactions	More willing to disagree
	Less concerned about being polite
Slower communicative exchanges	More utilitarian, business-like relations
Less expressive messages	More utilitarian, business-like relations
Simultaneity of multiple responses	Everyone has equal voice and consideration
	Less oppressive/stifling conversations

Table 52. Chat Impact on Relationships

The bulk of the chat's perceived impact on *Relationships* and relational experiences (more than 61 percent of the comments) was attributed to non-verbal issues. For instance, the lack of non-verbal cues such as tone of voice hampered the development of a more personable environment—participants were limited to stoic, transactional, or impersonal relations with others (also evident in the *Emotions* discussion). However, such dilution of relational issues was not always perceived negatively in light of group's overriding concern to complete the task, i.e.,

> …relationships can sometimes get in the way of completing a task so the chat took that out of the way—almost took the human factor out of the way…we focused on the business at hand.

Yet, without the ability to see or gauge the reactions of others, participants indicated they were less concerned about being polite because there were no perceived relational repercussions for *any* type of message; and that they were also more willing to disagree with others, e.g.,

> If I said something that everybody didn't agree with, I wouldn't know right away…I would feel okay disagreeing and offering up alternatives…because even if they were all going to roll their eyes or something, I wouldn't know.

Relational issues were also affected by bandwidth limitations though such impact was articulated with far less frequency (22 percent of the participant comments). For instance, slower and less expressive messaging further contributed to the perception of professional, business-like relations within the group because there was no easy way to tend to anything but the task, e.g.,

> It cut the majority of the small talk because you are not going to type a lot of extra stuff, the joking and meaningless chatter. You got down to business…If you wanted to get a thought out that is two sentences long, you've got to type it before they move on to another subject so there isn't time to sit around and lollygag.

The remaining comments indicated positive relational effects due to the ability to support multiple simultaneous responses; no one could interrupt, talk over, or "bulldoze" other members of the group. Such conditions produced less contentious or stifling relations between members because everyone was "…guaranteed of having a say since everybody's response is typed out."

e. Communication → Group Roles.

Aspect/Theme of Chat Medium	Effects
Conversational trace	Eliminated need for certain roles
Slower communicative exchanges	Less time to worry about roles
	Roles based on typing speed versus merit
Fewer barriers to contribution	Sense of equality reduced perceived need for role differentiation
Fewer social rules to manage conversation	Chat provides its own structure; no need for oversight roles to manage conversation
Lack of non-verbal sensory and feedback cues	Equalized all group members; no sense of role differentiation

Table 53. Chat Impact on Group Roles

The two most common themes jointly accounted for 62 percent of all comments. First, the conversational trace provided an explicit means of maintaining collective

memory; therefore, a recorder or secretarial role was not needed. Second, the reduced speed of the conversational exchanges left less time to worry about the establishment of group roles at all. Participants indicated they simply "skipped that part" because it would take too long to talk about how the roles should be established or what functions they served. Those wishing to assume leader or manager roles were also limited by messaging speed; faster typists were perceived as more likely to manage or lead the group because their comments would be most frequently seen on screen.

Simultaneous responses from multiple group members were also commonly cited for affecting *Group Roles* and accounted for 23 percent of the discourses. Specifically, participants experienced a sense of equality that diffused role differentiation because there were no barriers to contribution; everyone's voice was "heard" or least posted regardless of whether they were ignored or not. Furthermore, because the chat provided its own conversational structure where everyone was given an equal voice, participants felt little need for someone to provide oversight, managerial, or administrative functions that might otherwise curtail or constrain communication.

The remaining comments indicated that role differentiation was normally based on non-verbal cues such as tone of voice or body language. Without those cues to draw upon in the chat, participants had not basis to respond to the kinds of role-related issues they might otherwise have attended to in different settings; they therefore didn't bother differentiating any roles at all.

f. Communication → Logistics.

Aspect/Theme of Chat Medium	Effects
Visual record of collective memory	Automatic log of what's done/decided; no need to expend effort tracking progress manually
	Sense of finality—less debate over what is left to be discussed
	Easy to see how others might fit into future logistical processes based on past decisions
Simultaneity of multiple responses	Hard to establish continuity of thought/effort
	Hard to know when it was time to move on
Slower communicative exchanges	Less time/effort establishing logistics
Less expressive/truncated messages	Harder to conceptualize entire problem
Reduced sense of accountability of others	More time consumed establishing accountability rather than focusing on task
Lack of shared reference	Difficulty coordinating efforts
	Increased effort verifying actions/discussions

Table 54. Chat Impact on Logistics

More than a third of the participant comments attributed the chat's conversational trace to the experiences and perceptions of *Logistics*. Common sentiments indicated the chat was more than a medium to communicate. For example, rather than writing things down individually to summarize the group's decisions or chart the group's progress, the words on the screen provided a visual record of which parts of the problem had already been answered and how. The fact that the group's efforts were committed to a shared screen also lent an air of finality and validity to the group's decisions that eliminated a lot of back-tracking or second-guessing, e.g.,

> We went through it with step one; and when we came up with an answer we'd say "Number One," and then we'd all write "Yes" if we agreed. That limited some of the debate after we had decided—there were no second thoughts.

Finally, the conversational trace gave participants a sense for how other individuals might figure into the remaining logistical processes because it was easy to see how others had weighed in on past issues. Therefore, clues as to how they might respond to new issues were readily available.

Simultaneity of multiple responses was also commonly cited and accounted for 24 percent of the comments. Participants indicated they had difficulties assessing task progress or milestones because the flow of points and counterpoints seemed so unorganized. Nearly as common (another 18 percent) were perceptions that the limited verbal bandwidth of the medium "short circuited" discussions that might otherwise have been devoted to the group's logistical needs, similar to the effects for *Group Roles*. Participants did not spend time discussing how they were going to finish the task, or conceptualizing the problem before jumping in to tackle it, e.g.,

> We didn't even talk about, "Hey, do you think water is most important or do you think food is most important?" We were just saying, "This is important because you can use it or not; this is more important than that." Everyone is just thinking it out in their head but no one is saying why.

Neither of the last two issues was expressed with great frequency though each accounted for an equal proportion of the remaining discourses. First, a lack of accountability resulted in wasted time and effort ensuring others were paying attention and agreed with the group's decisions rather than in reaching a decision at all, i.e.,

> There's a lot of, "Oh, I agree" or "Yeah, me too," and it just takes so long to keep going…you get muddled down like this—everybody having to let everybody know that they are listening and that they are here.

Second, coordinating group efforts was extremely difficult without a common reference beyond the chat log itself; participants couldn't point a particular passage on the page or to a drawing they had sketched on their notepads. Furthermore, they had no place outside of the chat log to maintain meta-process information—short summaries, bullets, or lists

that would have served as logistical waypoints that did not require a re-check of the log itself to confirm, e.g.,

> …that's one of the biggest hindrances—it seems to be harder to know where you stand as a group…you're going to have to reiterate, "What did we decide here?"

g. Communication → Teamwork.

Aspect/Theme of Chat Medium	Effects
Fewer barriers to contribution of effort	No one dominated conversation
	Everyone's voice was heard/considered
Reduced sense of accountability of/to others	Can't get good sense of effort/involvement from others
	More comfortable contributing to team thanks to insular/anonymity effects
More time to compose accurate messages	Better quality inputs
	Shifts attention away from working as a team

Table 55. Chat Impact on Teamwork

The most common effects of the medium were described as a function of simultaneity of multiple responses and accounted for nearly 56 percent of all relevant comments. Again, participants expressed a sense that the chat enabled everyone to participate "on an even playing field" and that all voices were heard with equal emphasis and consideration. Thus, without the chance for any one to dominate or drown out the voices of others, participants experienced a heightened sense of cooperation and collaboration that enhanced teamwork in the chat condition.

However, the reduced accountability of others detracted from a sense of teamwork and was also a fairly common perception, evident in 38 percent of the comments. Specifically, participants lacked the non-verbal and sensory information necessary to tell if others were slacking, "sitting at their desks thinking hard," or in the

middle of typing a response. Therefore, misperceptions of social loafing were generated during conversational lulls that detracted from a sense of healthy teamwork. Only one person found a lack of accountability helpful for generating teamwork because the insular quality of the chat let her maintain a sense of anonymity; she could "be who she wanted to be" and contribute more freely to the group.

The remaining comments indicated a somewhat ambivalent experience based on the limited verbal bandwidth of the chat. For instance, the ability to dedicate more time to crafting a better message provided better "raw materials" for the team work with, but it was also perceived as a hindrance to teamwork simply because interactivity between members was so limited, e.g.,

> It tends to stifle collaboration because people think more about what they are going to type, rather than just come out and work together. If you are actually going to go to the effort of typing, you want to make sure it is worth saying.

h. Communication → Task Focus.

Aspect/Theme of Chat Medium	Effects
Slower communicative exchanges	Less extraneous or distracting conversations
Less expressive/truncated messages	Formalized conversation; pressure to keep things business-like
Conversational trace	Pressure to keep on task
Reduced sense of accountability to others	Potential to multi-task and lose focus
	Less social pressure to keep on task

Table 56. Chat Impact on Task Focus

Two thirds of the participant comments indicated that verbal bandwidth limitations enhanced a sense of task focus because the added time and effort required to compose and exchange messages resulted in a dramatic reduction in extraneous conversation, e.g.,

> Nobody would take the effort to just say something completely random—start talking about their weekend or something like that...It's not like casual talk where you can be on task and take a quick second to comment on something to the side; it takes time to type and press enter and then wait for people to read and respond.

Furthermore, because exchanged messages were necessarily less expressive or truncated in composition, the atmosphere surrounding the groups' efforts remained more professional and business-like, further enhancing task focus. Common sentiments suggested that "every word counts" and participants felt pressured to keep their comments more task-relevant because they had to think about what they were about to type rather than blurt out whatever occurred to them. Such pressure to remain task focused was also exerted by the conversational trace. Participants perceived a sense of social pressure to remain on task because any irrelevant or side discussions would be permanently logged in the chat transcript and thereby indicate who amongst the group was not seemingly committed to the achievement of the group's goals.

Remaining comments indicated that the lack of accountability created a strong potential for losing task focus—though in practice it did not occur during the study. Specifically, because no one had a sense of whether individuals were completely focused on the task, there was a temptation to multitask. Participants indicated they would have checked their e-mail, surfed the Internet, or chatting with others outside the task simply because they could without any fear of social repercussion or disapproval for coming off task.

i. Communication → Synergy.

Aspect/Theme of Chat Medium	Effects
Slower communicative exchanges	Limited interaction during discussion
	Reduced ability to build on random thoughts and ideas
Less expressive/truncated messages	Limited emotional involvement in problem-solving process
	Less likely to engage others in synergistic discussion
Difficulty gauging reactions of others	Reduced ability to recognize potentially creative diversions
	Limited emotional "reward" for engaging in synergistic activity
Simultaneity of multiple responses	Greater diversity of ideas

Table 57. Chat Impact on Synergy

Only one participant suggested that chat conferred any synergistic benefits because its support of multiple simultaneous inputs provided no chance for a single person to dominate the conversation. Much more commonly (70 percent of the comments), participants perceived negative effects due to verbal bandwidth limitations. First, slower pace and higher conversational overhead limited the degree to which creative or synergistic communication could occur at all. Participants could not easily interject new ideas in the middle of a conversation and still have the context of their thoughts universally understood, nor could they easily ramble or "bounce ideas of each other" until an errant thought or spark of inspiration struck. Second, limited expressivity of the exchanged messages reduced the sense that the task environment was creative or "alive" enough to draw others into synergistic discussions, e.g.,

> Because it makes everyone's opinions seem drier, you're less likely to feel engaged; therefore, you're less likely to influence others to become more engaged in the whole process.

Difficulties reading and interpreting the reactions of others also reduced opportunities to engage in synergistic or creative asides because no cues were available to indicate that someone was on the verge of "brilliant idea" that needed to be explored through tangential conversation. Participants also reported little incentive to even *try* exploring those creative asides without the ability to respond to the reactions of others. Specifically, synergy was perceived as a cumulative function of the positive reactions from others which were unavailable through the chat, e.g.,

> You are not really rewarded as much for diverging from the topic; you don't get those animated facial expressions that you sometimes get. Psychologically, I think our reward from people is getting a positive reaction.

j. Communication → Final Production/Resolution.

Aspect/Theme of Chat Medium	Effects
Slower communicative exchanges	Too much time spent on "simple communication" rather than finishing task

Table 58. Chat Impact on Final Product/Resolution

The relationship between the chat and the *Final Product/Resolution* was expressed unilaterally in terms of verbal bandwidth limitations. Specifically, the reduced rate of message exchange made participants feel less communicative overall. Consequently, the final product simply couldn't be reached satisfactorily in the allotted time because any exchanges involved effort and time both in typing and reading; a great deal of time was consumed just in "simple communication" rather than task-oriented communication aimed at achieving the goal.

k. Communication → Influence.

Aspect/Theme of Chat Medium	Effects
Reduced sense of accountability of/to others	No sense of individual influence because there was no sense of other individuals
Lack of non-verbal sensory and feedback cues	Influence was equalized or eliminated across entire group
Slower communicative exchanges	Influence level based on frequency of input
	Difficult to express charisma or quickly "thinking on your feet"
	More time to craft counter-points to particular influence moves
Presentation issues	Proper grammar/spelling increased influence
	Visual flourishes and embellishments (punctuation, all caps) reduced influence
Difficulty establishing context for messages	Easier to "miss" influence in message itself

Table 59. Chat Impact on Influence

Perceptions and experiences of *Influence* were resoundingly voiced in terms of chat's lack of non-verbal sensory and feedback cues; over 61 percent of the participant comments were keyed to this aspect of the medium. The bulk of the perceived effects concerned difficulties establishing a sense of accountability—no one was particularly influential because participants did not get a good sense of who anyone was. Common sentiments were feelings of anonymity, insulation from status or age differentials, and being "…conscious of the fact that everybody is kind of invisible in a chat environment." In fact, despite the individual names that appeared next to each new comment, participants simply perceived the conversation as a flood of information on the screen and did not differentiate or attribute those comments to specific individuals. Thus, no one person was more influential than any other even if they did submit a persuasive

argument. Discourses were also quite explicit in that certain non-verbal cues alone such as body language or tone of voice could be influential, regardless of what was actually said. Thus, the lack of any non-verbal cues per se also reduced or at least equalized, interpersonal influence.

Less common were the effects bandwidth issues and presentation, both of which were implicated with equal frequency and together accounted for 35 percent of the discourses. First, the increased time needed to communicate at all was perceived (rightly so or not) as reduced participation. Consequently, those individuals who took longer to get their points across were less influential because they didn't play as large a part in the group discussions, e.g.,

> She wasn't as much as a dominating force as the rest of us. I think it was more of a frequency issue that she didn't speak up as often and sometimes when she did it was something we had already talked about earlier.

In addition, the added time and effort required to commit a new message to the discussion reduced the influence one might have exerted simply by being charismatic or "quick on their feet" in delivery. The conversational latency also afforded others more time to compose a more persuasive message in response to any particular influence move from other group members.

Second, individuals who used proper grammar, spelled out entire words as opposed to using "chat shorthand" abbreviations, or were careful about their spelling were perceived as more influential because the message they were trying to get across probably warranted such attention to detail and were therefore reasonably good ideas to begin with; or it was taken as a sign of greater intelligence and therefore "…their ideas carry a little bit more value." Similarly, for those who were poor spellers, presentation issues reduced perceived influence because,

> …they seem really illiterate. You might think, "God, what a stupid opinion." It may make you want to put your point across or make you not want to listen to what someone has to say because it reads like they are stupid.

Furthermore, individuals who tried to augment the expressivity of their words using punctuation marks or capital letters were also perceived as less influential because the use of such flourishes and embellishments were regarded as inappropriate for the more business-like task environment.

The final few comments indicated that influence was potentially "easy to miss" within a single message due to limited messaging context. Specifically, any points raised amidst a flurry of simultaneous responses could be difficult to tie back to a single line of reasoning or establish a sense of continuity in the rationale that would otherwise have proved influential, e.g.,

> …if you wrote something down and it wasn't dealing with exactly what was said before, somebody may have just scanned over that, then went on to reading the next person's response because they might not have understood the connection to what you wrote, where it came from, or where it was leading to.

4. Summary Results

As indicated at the start of this section, the chat capability exhibited the greatest complexity of perception and experience of any medium in the study—perhaps because it is technologically the farthest removed from the unmediated state of face-of-face communication. It is also possible that the reported complexity of thought was somewhat illusory because many of the individual issues and relational mechanisms discussed above might well be elements or sub-components of larger, unnamed factors that could also account for the results. For example, the many issues associated with verbal bandwidth limitations, and those associated with the lack of non-verbal cues, are clearly related to the same underlying notions of limited bandwidth.

However, study participants were often quite explicit during the interviews regarding which particular aspects of the bandwidth limitations were relevant to their experiences and perceptions. In some instances, participants said they didn't have the right words to accurately express their thoughts and feelings; in others, they didn't have time to compose a message that could express their thoughts and feelings; in still others, the expressivity of their words were not the issue at all. Therefore, without exploring some the more granular aspects of the participants' experiences and perceptions, the results might belie some important details or aspects of the media that would be relevant for additional analysis, inquiry, or intervention. For example, the efforts undertaken to improve verbal throughput might not be the same as those employed to improve a sense of accountability—yet both arguably address limitations in bandwidth. The reported complexity of thought also provides a better indication as to which aspects of the communicative environment might be affected by changes in the use or implementation of the medium, and how those effects might be manifest in terms of individual or group outcomes.

Of the eight aspects of the chat medium identified above, unfamiliarity of the supporting hardware and interface design were only relevant to participants' initial reactions and perceptions to the medium itself; only the *capabilities* of the chat as a medium for communication and interaction proved relevant to later perceptions and experiences of other system affinities. Timekeeping issues were only relevant factors for the *Incentives/Motivation* affinity though the time-stamps themselves were a positive motivational factor. The lack of a common reference was only problematic managing and resolving logistical issues during the task itself. Similarly, presentation issues only played a part in experiences of *Influence*.

Of the remaining four issues, the conversational trace and simultaneity of multiple responses were responsible for perceived effects on several other system affinities; however, limitations in verbal bandwidth and non-verbal cues each played a part in the perceptions and experiences of all but one affinity each. Specifically, the lack of non-verbal cues was the only issue responsible for negative perceptions of *Group Establishment/Formation*; verbal bandwidth was the only issue responsible for the negative results of the group's *Final Product/Resolution*.

As illustrated in Figure 15, the overall experience via the chat was ambivalent. Seven of the ten affinities (as well as experiences of *Influence*) were perceived with positive or negative valence depending on the unique combinations of individuals and circumstances within each group. Such ambivalence indicates a good deal of complexity of thought and experience regarding the chat medium and the possibility for a great deal of intervention or adjustments to the medium's implementation and use. In particular, the results indicate the potential for chat to produce or contribute to a series of very positive intermediate and feedback-type effects within the system of relationships between elements of the communicative context that could ultimately outweigh the singularly negative effects at the leading and trailing ends of the process, i.e., the establishment of the group itself, the synergy they might experience, and the resulting final product or resolution of their efforts.

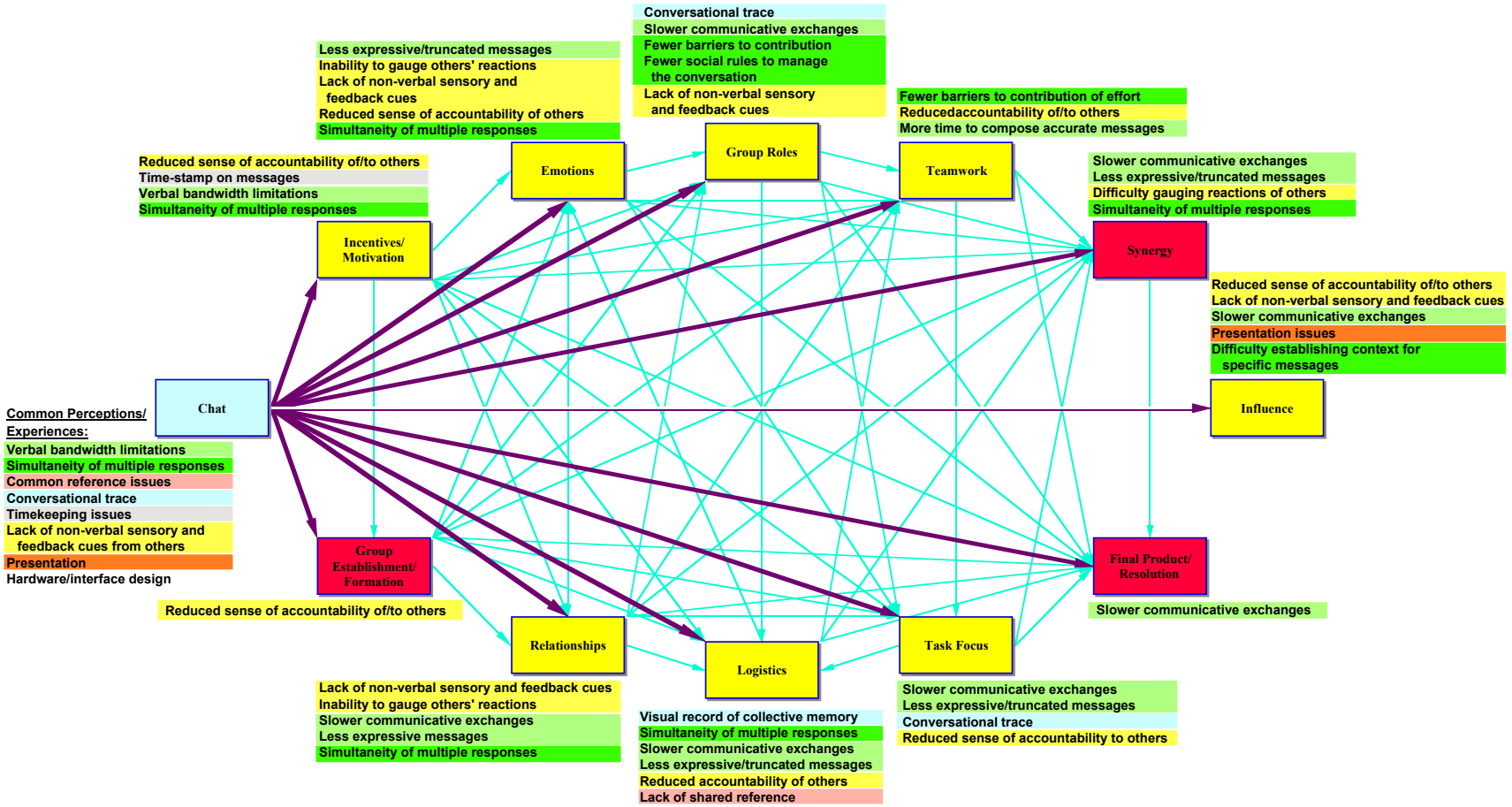


Figure 15. Elements of Chat Responsible for Perceived and Experienced Relationship

E. SUMMARY COMPARISONS BETWEEN MEDIA

The following comparison illustrates some of the issues raised in the past three sections. As previously discussed, participants found the face-to-face medium to have a resoundingly positive effect on the entire perceptual system of experience during Phase 2 of the study (as well as the experience of influence within the group itself). The other two media, operationalized through various implementations of communication technology, produced a series of negative or otherwise ambivalent perceptions and experiences, but no effects that were characterized as predominantly positive.

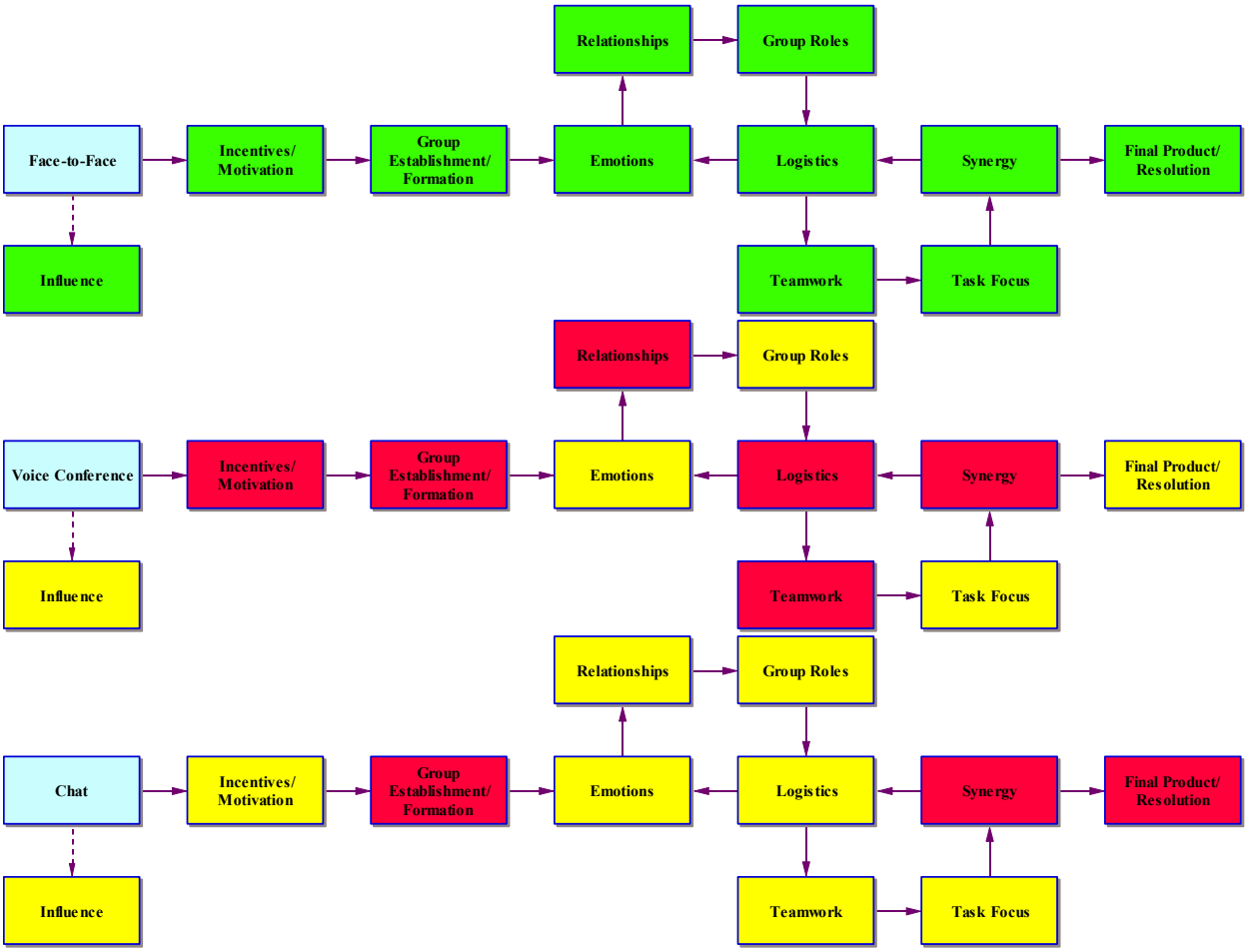


Figure 16. Media Comparisons: Systems of Perception and Experience

Both the voice conference and chat capabilities were perceived to have negative effects on participant feelings and experiences surrounding the formation and establishment of their respective groups. Common sentiments indicated that participants felt detached and disconnected to others, never able to make connections required to feel like they were part of a cohesive group at all. Similarly, both the voice conference and chat had negative effects on synergy within the task groups. Common results for both media indicated an inability to engage in the kind of free-flowing conversation that allowed members of the group to build upon the thoughts and ideas of others. Both the voice conference and chat were also perceived as producing ambivalent feelings and experiences for the *Influence*, *Emotions*, *Group Roles,* and *Task Focus* affinities.

Table 60 indicates the frequency with which each media issue or theme was linked to a specific outcome or effect within the larger system of representation. Individual frequencies associated with each non-verbal issue have also been provided for greater clarity. Using the frequency each issue was invoked as a proxy measure of importance or magnitude of effect, the results indicate that the non-verbal aspects of the media capabilities had the greatest impact in determining the outcome of the participants' experiences and perceptions within the task groups.

Face-to-Face		Voice Conference		Chat	
Non-verbal physical/sensory feedback cues: 23	Accountability: 8	Non-verbal physical/sensory feedback cues: 14	Accountability: 6	Non-verbal physical/sensory feedback cues: 14	Accountability: 7
	Reactions: 8		Reactions: 5		Cues (per se): 4
	Presence: 3		Cues (per se): 3		Reactions: 3
	Rhythm/flow: 3		Rhythm/flow: 7		Verbal bandwidth: 14
	Cues (per se): 1		Common reference: 2		Simultaneity of multiple responses: 8
Common reference: 2		Timekeeping issues: 1		Conversational trace: 3	
Verbal bandwidth: 2		Medium itself: 1		Common reference: 2	
Medium itself: 1		Total: 25		Presentation: 1	
Total: 28				Timekeeping issues: 1	
				Total: 43	

Table 60. Media Comparisons: Perceived Mechanisms of Causation and Effect

Not surprisingly, the magnitude of effect or proportion of contribution of these non-verbal issues seemed to decrease as the media capabilities offered fewer non-verbal modalities for communication to occur (yellow highlights). In the face-to-face condition, the abundance of information gleaned from various non-verbal cues accounted for nearly all the effects that were articulated in the participants' system. During the voice conference, participants indicated they were still able to make use of *some* sensory information and cues provided by tone of voice and other vocal qualities; therefore, the variable degree to which non-verbal and feedback cues were available (less than face-to-face but more than chat) was still responsible for a bulk of the effects observed within the system. However, the remainders of the causal mechanisms were attributed to a combination of other factors. In chat, the complete lack of non-verbal cues played as large a role as verbal bandwidth limitations did in the outcomes of participant system; yet they still featured prominently amongst the perceived mechanisms of effect between the medium and the rest of the system. Of all the *specific* issues associated with non-verbal cues and feedback information, issues of accountability were the most common across

the three media (green highlights); the ability to gauge and interpret reactions of others was also commonly cited.

Working in the opposite direction, the role verbal bandwidth played in the systemic effects increased as the number of modalities decreased (though relevant to the perceptions of the voice conference condition, verbal bandwidth was not explicitly perceived to have a direct affect on other affinities for that medium). In addition, the face-to-face participants indicated that the ability to establish and maintain natural and smooth conversational flow stemmed from the availability of non-verbal and other sensory cues. In the voice conference condition, the quasi-full duplex operation of the speakerphone system produced a much more segmented and sporadic conversational flow. In chat—the capability of the medium itself supported multiple simultaneous responses which, among other outcomes, reduced the continuity and sense of conversational flow even further. Therefore, participants expressed sensitivity to conversational rhythm and flow regardless of which medium they used; however, the importance of disruptions to that rhythm in relation to the other system affinities also seemed to increase as the number of modalities decreased (blue highlights). Common reference issues, though not invoked as part of very many relationships between media and other system affinities, were relevant in all three media conditions and to *Logistics* in particular across all three media.

Individual responses to the use of the medium itself were only explicit in the face-to-face and voice conferencing conditions. The chat per se did not seem to evoke any noticeable reactions within the system of other affinities; only the capabilities of the chat or the way in which it impacted other elements of the communicative context were explicitly discussed in the interviews. Timekeeping issues associated with the use of a particular medium was observed to have an effect on individual incentives and

motivations in the two technology-based media conditions. The importance of timekeeping issues was also recognized by the face-to-face participants as a relevant aspect of the experiences within the face-to-face medium, but it was not perceived as having any explicit impact on the other system affinities.

The notion of a sense "presence" was explicitly articulated as a function of the abundant non-verbal and sensory cues available face-to-face. Specifically, the face-to-face environment produced a heightened sense of presence that was then perceived as responsible for several other positive effects in the *Group Roles*, *Synergy*, and *Influence* affinities. Issues of presence were not themselves expressed as causal mechanisms or aspects inherent to the voice conference or chat. However, participants using these media indicated they perceived a lack of presence during their task group meetings, but only as such perceptions were situated within *other* elements of the system: *Group Establishment/Formation*, *Relationships*, *Teamwork*, *Group Roles*, and *Influence* affinities. Furthermore, the lack of presence in both the voice conference and chat conditions was almost unanimously (only one instance to the contrary) attributed to the lack of accountability of others in the group which was, itself, perceived as a result of limited non-verbal information and sensory cues. Therefore, these comparative results indicate that issues of presence were salient in the face-to-face condition as an independent aspect of the medium itself while the voice conference and chat participants experienced presence only as an accountability-based outcome once the medium's affects on other affinities was considered.

The summary data reported in Table 60 also indicate that what people felt was important or relevant about media, whether face-to-face, or technology mediated, was relatively similar. For instance, each medium was perceived as a function of only a handful of elements; of those, only the conversational trace and presentation issues of the

chat were not accounted for as either an effect by or causal mechanism of the other media. However, as figures 13, 14, and 15 indicate, the mechanisms for realizing or exerting media impacts on the system affinities often became more complex as the number of cues and modalities afforded by the medium decreased.

For instance, perceptions of *Influence* face-to-face were positively impacted by the effects of non-verbal cues alone. In the voice conference, non-verbal cues produced ambivalent perceptions and experiences as did the imposed conversational rhythm and structure. In the chat, *Influence* was driven to ambivalence by a lack of non-verbal cues, low verbal bandwidth, presentation issues, and simultaneity of multiple responses. The following tabular comparisons help illustrate the preceding points by indicating the media components or issues that featured in the relationships between each affinity, whether the affinity outcome was positive, negative, or ambivalent, and how they compared with the other media. Issues associated with non-verbal cues have been broken out as they were in Table 60; however, they do not appear in precedence order (proportion of comments) to more easily facilitate specific comparisons across media.

Incentives/Motivation			**Group Establishment/Formation**		
Face-to-Face	Voice Conference	Chat	Face-to-Face	Voice Conference	Chat
Accountability	Accountability	Accountability	Reactions	Reactions	Accountability
	Timekeeping	Timekeeping		Accountability	
		Verbal Bandwidth	Non-verbal cues	Rhythm/Flow	

Emotions			**Relationships**		
Face-to-Face	Voice Conference	Chat	Face-to-Face	Voice Conference	Chat
Reactions	Reactions	Reactions	Reactions	Reactions	Reactions
		Verbal Bandwidth			Non-verbal cues
		Non-verbal cues			Verbal bandwidth
Communication setting/medium	Communication setting/medium	Accountability	Accountability	Accountability	
		Simultaneity of multiple responses			Simultaneity of multiple responses

Group Roles			Logistics		
Face-to-Face	Voice Conference	Chat	Face-to-Face	Voice Conference	Chat
Reactions	Reactions	Conversational Trace	Accountability		Accountability
Rhythm/Flow	Rhythm/Flow	Simultaneity of multiple responses	Reactions		Simultaneity of multiple responses
Accountability	Accountability	Verbal Bandwidth			Verbal Bandwidth
Common Reference	Non-verbal cues	Non-verbal cues			Conversational trace
Presence			Common Reference	Common Reference	Common Reference

Teamwork			Task Focus		
Face-to-Face	Voice Conference	Chat	Face-to-Face	Voice Conference	Chat
Reactions	Reactions	Accountability	Accountability	Accountability	Accountability
Accountability	Accountability			Non-verbal cues	Conversational trace
Rhythm/Flow	Common Reference	Verbal Bandwidth			
	Rhythm/Flow	Simultaneity of multiple responses		Rhythm/Flow	Simultaneity of multiple responses

Synergy			Final Product/Resolution		
Face-to-Face	Voice Conference	Chat	Face-to-Face	Voice Conference	Chat
Reactions	Rhythm/Flow	Reactions	Verbal Bandwidth	Rhythm/Flow	Verbal Bandwidth
Accountability		Simultaneity of multiple responses			
Presence					
Verbal bandwidth		Verbal Bandwidth			

Influence		
Face-to-Face	Voice Conference	Chat
Accountability	Non-verbal cues	Accountability
Reactions		Presentation
Presence		Verbal Bandwidth
		Non-verbal cues
Rhythm/Flow	Rhythm/Flow	Simultaneity of multiple responses

Table 61. Affinity Comparisons: Perceived Mechanisms of Media Causation and Effect

Finally, Table 62 illustrates the affinity comparisons for *Influence* itself. With few exceptions, the "baseline" experiences and perceptions of interpersonal influence were strikingly similar for all participants. In the voice conference, however, the passion and conviction of others (highlighted*) was not expressly articulated during the interviews until after participants considered how the voice conference affected *Influence*. Specifically, participants reported that the medium's support for non-verbal cues conveyed by tone of voice provided an indication as to the strength or confidence of one's beliefs and opinions which was in turn influential for others. In addition, the chat participants reported losing virtually all sense of individual *others* in their groups; an effect that most likely accounts for the lack of majority and conformity forces of influence that were present in the face-to-face and voice conference conditions. The implications of these findings in relation to the research questions will be discussed in the final chapter.

Influence		
Face-to-Face	**Voice Conference**	**Chat**
Rationality or persuasiveness of information	Influence strategies: rational persuasion and consultation/idea support	Influence strategies: rational persuasion and consultation/idea support
Guiding or pacing group activity and focus	Guiding/pacing group activity and effort	Guiding or pacing group activity and focus
Individual characteristics	Individual characteristics	Individual characteristics
Passion and conviction of others	(Passion and conviction of others*)	Passion and conviction of others
Implicit influence: majority and conformity	Implicit influence: majority and conformity	

Table 62. Influence Experiences and Perceptions Between Media

Chapter IX - Analyses and Conclusions

A. RESEARCH QUESTION 1

1. Discussion

One of the purposes of this study was to examine how communication technology might affect or change the nature of symbolic, communicative behaviors designed to influence others. In the course of answering this question, seven well-established and well-validated measures of influence behaviors were chosen from the relevant literature for their supposed commonality and applicability across a variety of settings: rational persuasion, consultation and idea support, ingratiation, exchange, coalition tactics, pressure, and upward appeals. From a behavioral standpoint, the recorded incidence of these various measures indicate that "information-based" influence, such as that embodied by rational persuasion or consultation and idea support (where others are invited to explore and contribute to the soundness and rationality of the information), was commonly enacted and expressed within the collaborative group settings of this study.

However, influence messaging strategies based on building majority support (coalition tactics), hierarchical issues (upward appeals), resource- or outcome-control (exchange), or socio-emotional and relational factors (pressure and ingratiation) were not enacted often enough to provide any meaningful basis for comparison or analysis. Thus, the observational measures (regardless of any differences between them) provide only partial validation for the presumed commonality and applicability of the influence message inventories selected for use in this study. Specifically, the remainder of the influence processes and social structures for influence embodied by the Profile of Organizational Influence Strategies (Kipnis et al., 1980; Kipnis & Schmidt, 1988;

Schriesheim & Hinkin, 1990), the Influence Behavior Questionnaire (Yukl & Falbe, 1990; Yukl et al, 1993; Yukl & Tracey, 1992), and the inventory of Political Influence Behaviors (Allen et al., 1979; Sussman et al., 2002) did not behaviorally account for a majority of the common experiences and perceptions of interpersonal influence.

Based on the influence messages that *were* expressed during the structured group experiences, the results indicate that media differences did not have any appreciable impact on the exchange of either rational persuasion or consultation and idea support messages. The lack of significant differences between media was observed regardless of whether the measures were based on frequency of message expression or the proportion of all influence messages accounted for by each message type. Perceptual data collected during the Phase 3 interviews closely correspond to these findings. All participants noted that rationality or rational persuasion were part of their experiences of influence. The chat and voice conference participants also perceived others' efforts to engage in consultation and idea support as relevant to experiences of influence. However, the obtained results were surprising for several reasons.

First, as one of the few studies which directly examined how influence-seeking behavior varies with the media, Sussman et al. (2002) observed that idea support was far more likely to be enacted face-to-face than over a technology mediated channel such as a phone or through e-mail. Though the present study used observational rather than projective data; participants in the face-to-face condition did not even perceive (or at least report) consultation and idea support as relevant to their perceptions and experiences of influence. Furthermore, the lack of differences in such messaging behaviors between media does not suggest a propensity for using consultation or idea support moves via face-to-face any more frequently than via other media.

Second, Wilson (2003) reported that CMC-media users had greater difficulty rendering or enacting influence attempts based rational arguments than individuals in face-to-face conditions. Assuming these findings were truly endemic of "…relatively stable and specific attitudes that users will act upon in determining their use of CMC…" (Wilson, p. 548), frequency of expression or proportion of total influence messaging for rational persuasion messages should theoretically have been lower in the chat than the other two conditions. Or, it might have been that chat users recognized such difficulties and compensated by increasing the number of rational persuasion messages relative to other forms of influence. While the reduced throughput of the chat might not have indicated differences in frequency between media based on such a relative increase of rational persuasion messages, the proportionality of influence messaging would be expected to differ between media as a result of any compensatory messaging strategies.

Third, and perhaps most fundamentally, differences in interaction patterns between face-to-face and CMC-based task groups have often been attributed to the fact that it takes longer to type something than to say the same message verbally (Hollingshead & Contractor, 2002). Perceptual data from the chat participants and transcript analysis confirmed this to be so during the study as well. Logically, the incidence or proportions of the expressed influence messages in chat should have been lower than those for the face-to-face and even voice conditions if there was simply less time in chat to express any messages at all, influence or otherwise.

2. Implications

Given the findings and rationale reported in the studies above, it was logical to have expected at least *some* differences in influence messaging behavior between media. The fact that no such differences were observed suggests that participants experienced a kind of "conservation of informational influence" regardless of medium. Practically

speaking, the results imply that the persuasiveness of information, or of having a hand in shaping and bolstering the persuasiveness of the information, survived the transition from one media to the next. Thus, a notion such as Raven's (1965) informational power becomes a much more informative factor in terms of media selection and use—partly because it renders the selection itself a moot point.

Specifically, informational power is rooted in the *actual content* of the messages communicated between others—separate from any issues relating to *how* the messages are communicated. Therefore, assuming no additional forces of influence were relevant to a decision or course of action, any efforts or pains taken to make optimal media selection decisions might ultimately be superfluous. In short, a phone call, office visit, instant message, perhaps even an e-mail or memo could be just as influential based *solely* on the persuasiveness of the information contained in the message itself.

These results also help account for why a priori theories of media selection have received equivocal support during behavioral studies where users have employed relatively lean media to accomplish highly equivocal tasks (Dennis & Kinney, 1998; Fulk, Schmitz, & Steinfield, 1990; Markus, 1994a). As proposed in Chapter II, a priori theories of media selection (media richness and social presence) are in fact implicit theories of interpersonal influence. If in practice, however, the effectiveness or persuasiveness of the information needed to influence another need not be matched to an "appropriate medium" for expression, then the hypothesized matches or mismatches in "task-fit" between media and task equivocality would not always produce results consistent with the theories' predictions.

3. Extensions

a. Procedural influence behaviors.

The perceptual data reported in Table 62 indicated that perceptions and experiences of influence were much more complex than what was accounted for by rational persuasion and consultation/idea support messaging behaviors alone. Furthermore, summary tables 33, 46, 59 described a myriad of perceived effects attributable to the face-to-face, voice conference, and chat media. Therefore, expanding the definition of influence beyond the behavioral measures of influence employed in this study provided additional insight as to how differences between media affected influence behaviors in general.

For instance, it was reported in Chapter VI that chat discussions were comprised of roughly half the total messaging content as the face-to-face and voice conference discussions. The fact that the frequency of rationality/rational appeal and consultation/idea support messages did not differ between media indicates that some other type of communicative behaviors *were* curtailed in the chat medium, if in no other way than a numerical reduction in total expression. It is possible such messaging behaviors had *nothing* to do with influence. Indeed, chat participants did report that the medium produced a more business-like, transactional environment that discouraged distracting asides and non-task relevant communication, mirroring past findings that CMC-based communication often centers on more task than socio-emotional issues (Hiltz et al., 1986; Walther & Parks, 2002).

However, participants in all three media conditions indicated that they perceived influence from other members who guided, reoriented, or paced the group's collective attention, focus, and conversational course. Therefore, it is possible that media differences did impact the expression of procedural influence messages—those that affect

logistics-like issues of how a group thinks about, converses about, or works towards solving its problems (e.g., Putnam, 1982; Zigurs et al., 1988), rather than the explicit facts or answers associated with the problem itself. Specifically, only the face-to-face participants indicated that the medium enhanced their ability to express procedural influence within the group. Consistent with the effects demonstrated in other studies of CMC-based interaction (Straus, 1999; Straus & McGrath, 1994), participants in both technology-enabled media conditions reported difficulties navigating the group's conversational path and affecting its collective attention and focus in relation to both *Influence* and *Logistics* affinities.

Thus, the perceptual results suggest that procedural influence may have been more difficult to enact via technology-enabled media than face-to-face during the structured group experiences. Yet, without a more detailed analysis of the procedural influence moves and processes extant during the structured group experiences, it cannot be said whether the media in this study exerted any measurable impact on the *amount* of total procedural influence expressed or in the *patterns* of how procedural influence messages were expressed (as was observed in Zigurs et al.'s, 1988, study of procedural influence behaviors and technology-enabled media). What can be said based on the perceptual reports is that the mechanisms by which procedural influence was likely affected included the degree to which technologies supporting the voice conference and chat disrupted or altered normal conversational rhythm, flow, and continuity; reduced the amount of communicative behaviors that could be expressed at any one time; and failed to easily support the sharing and orientation towards a common reference.

Practical implications of the perceptual findings suggest that influence via technology-enabled media might increase for those who naturally (or intentionally) work to compensate for the procedural and conversational deficiencies produced while using

those media. For instance, one could consider making explicit their efforts to interpret or integrate the groups' past efforts, provide a structure and organizing principle for the conversation to follow, or keep track of the group's progress and milestones as it works to complete its task. In fact, it has been shown that perceptions of group leadership can be determined by the degree to which one exercises or expresses such procedural influence moves over the course of the group's efforts (Pavitt, 1999). Therefore, one might increase total perceived influence amongst others in the group, and ultimately have a hand in determining the group's final outcome, by expressing more procedural influence messages that shaped the steps the group took to reach that outcome.

b. Perceptual influence processes.

Expanding the definition of influence even further into the participants' perceptual reports begins to tap processes and issues that may not be expressed in communicative terms that lend themselves to measurement. For instance, reports from all media conditions described influence based on a priori individual characteristics such as age, intelligence, experience, and academic standing; all of which are consistent with the notion that participants were responding to an expert-like base of social power and influence (French & Raven, 1959). However, the voice conference and chat participants (in particular) reported that the depersonalizing and insular effects so commonly attributed to technology-enabled media (Kraut et al., 1998; Markus, 1994b; Postmes & Lea, 2000) reduced their sense of individual others within the group.

Moreover, both face-to-face and voice conference participants reported that they were sensitive to forces of majority influence, not only in terms of influence per se, but also in terms of other affinities such as *Incentives/Motivation* and *Task Focus*. The causal mechanism relevant literature typically attributes to these effects is the lack of social and interpersonal cues that are otherwise present during face-to-face communication (Sproull

& Kiesler, 1986). These same cues, whether present or lacking, featured prominently in all participants' experiences and perceptions during the study; yet all were characterized as *non-verbal* sensory and feedback cues.

However, forces of majority influence were absent in the chat participants' overt discussions of the *Influence* affinity; though in one particular instance, the conversational trace did produce an implicit normative effect on participants' task focus. Specifically, because off-topic conversation was committed to the chat log, participants experienced a sense of social pressure to keep irrelevant conversation to a minimum. Yet, the chat participants' description of this type of influence was decidedly perceptual, not behavioral, i.e., normative influence to remain task-focused was self-imposed rather than explicitly enacted by others. The effect itself was also diluted by the fact that chat participants experienced opposing *reduction* in social pressure to remain on task due to a lack of accountability to others—an effect that was again directly linked to the chat's total lack of non-verbal cues.

Thus, the only time chat participants perceived any kind of majority-like social pressure was when their perceived anonymity and insulation from others was compromised by the permanent trace of their actions. Otherwise, participants in *both* technology-enabled media conditions perceived a reduction, equalization, or outright elimination of a priori individual and social forces of influence. And in a fashion consistent with those reported in studies of similar phenomena (Sia et al., 2002; Spears et al., 2002), participants attributed the effects on influence to their respective medium's variability or lack of non-verbal sensory and feedback cues.

Given the primacy of non-verbal cues and sensory information to the experiences and perceptions of influence, it is therefore unclear whether the contextual and a priori forces of influence at work in this study would have been verbally expressed at all as

Pfeffer (1981) suggests they should be. In fact, the near absence of coalition tactics messages across all media, despite reports that majority influence did play a part in this study, indicates the opposite was probably true—forces of majority influence (for those participants who perceived them at all) did not have to be explicitly cultivated or enacted verbally for their effects to be perceived. Therefore, the perceptual findings indicate that a great deal of the participants' sense of influence was not based in verbal terms at all, contrary to the more popular behavioral notions of influence as indicated in the literature cited in Chapter II.

What this clearly implies for communication scholars is that more attention could be paid to the roles non-verbal aspects of the communicative process play in generating and enacting perceptions of influence over others, something missing entirely from recent reviews of relevant influence research and thought (Dillard et al., 2002; Meyers & Brashers, 1999). In fact, even those who focus on cognitive processes of influence still conceptualize influence itself as a decidedly verbal activity (Dillard et al., p. 288), indicating much opportunity for additional exploration and refinement of theory. However, in terms media research, the perceptual findings imply something more fundamental about the way we might think about media.

c. Mechanisms for media effects on influence.

Participants in all media conditions reported experiences and perceptions of influence based on how strongly or how passionately others expressed their views and opinions. In the face-to-face and voice conference conditions, these perceptions were attributed entirely to non-verbal cues: body language, facial expressions, and tone of voice (solely so for the voice conference). Such cues were completely absent in the chat condition, and it has been established the chat in particular resulted in a pronounced desensitizing and depersonalizing effect on perceptions of others in the group. How then

could chat participants get a sense for the strength of another individual's convictions or beliefs?

Interview reports indicated that in a few cases, such convictions were explicitly enacted within the text itself, i.e. "I feel very strongly about this." However, participants also reported taking advantage of the increased latency of the conversations to better craft their responses in light of their own feelings about the matter, thinking harder and longer about what they were going to type and how they would phrase their arguments based on how strongly they wanted to make their case. Finally, participant reports indicated that when they truly wished to exert influence over others, they took extra time and care to correct their spelling and grammar errors and to spell out their words rather than using "flirty" or "inappropriate" abbreviations. Those who expressed less investment in resolving the task due to lack of interest or ambivalent feelings about the group's decisions even went so far as to express surprise at the fact that they "allowed themselves" not to be concerned with presentation issues during the study when they normally did so using chat in other settings.

Those on the "receiving end" of such messages indicated that the senders' efforts largely achieved the intended effects. For instance, a protracted pause following a proposal or question was perceived as a signal that "something big was coming in reply" and was therefore likely to be quite important to the message sender. Presentation issues also affected influence in the sense that those who took time and care to make sure their messages *looked* right were perceived as more influential because they obviously cared enough about what they were saying to do so.

Therefore, participants were clearly making use of and interpreting individuating and social cues based on the capabilities the chat *did* offer, even if the technology supporting the medium filtered out the types of cues normally used to generate such

perceptions. Voice conference participants also reported that tone of voice was solely responsible for their sense of influence based on "how strongly" someone felt about a particular issue. These participants were thus placing greater perceptual weight on the tonality and contextual cues that were supported by the medium. Together, these observations and perceptual effects fail to support an objective conceptualization of media based on such notions as richness or social presence.

Specifically, such objective notions of media presume a hierarchy of capabilities that are arrayed from more-to-less, and that those capabilities are directly linked to the social, non-verbal, and contextual cues available through the medium. The greater extent to which those cues are absent from technology-enabled media, the less effective or efficient the media are hypothesized to be for supporting social communication processes (barring additional task-related effects). However, the results of this study clearly show that technology-enabled media users could develop in socially and relationally positive ways to exert or perceive influence despite the lack of non-verbal cues. Participants formed impressions and reduced interpersonal ambiguity through compensatory attention to the remaining cues the technologies did afford, or by using alternative cues entirely.

These observations and participant accounts provide perceptual and anecdotal support for a Social Information Processing (Walther, 1992; Walther & Burgoon, 1992) perspective of the communication technologies used in this study. Though more commonly invoked in direct comparisons between textual, on-line environments and face-to-face communication (Walther & Parks, 2002), social information processing postulates that communication technology users are able and motivated to exchange social information through the content, style, and timing of their messages when non-verbal cues normally associated with face-to-face communication are unavailable (Walther & Parks, p. 535). Consistent with these propositions, chat, and to a lesser degree

voice conference, participants indicated that content, style, and timing issues did shape their perceptions of influence in the face of reduced or absent non-verbal cues that were used to achieve the same results in the face-to-face setting.

A social information processing perspective would also account for the systemic results observed during the study. For instance, the chat, though theoretically lower than the other media by objective measures of capability such as richness, presence, or even bandwidth, produced fewer negative outcomes in the perceptual system of affinities than the voice conference—a medium of arguably greater bandwidth that is thus able to carry more information. Based on objective conceptualizations of media, the voice conference's ability to transmit more information should have produced a greater sense or salience of social presence, or provided for a richer communicative process that should have been no worse than the chat. In this instance however, more—richness, presence, bandwidth—wasn't necessarily better for supporting social processes (such as influence), more was simply more.

The notion of social information processing directs attention away from such concerns of media capacity or efficiency and instead asks what *kinds* of information are preferable or necessary to support communicative *functions* between individuals. In this sense, it is arguably more informative to think of the media in this study, and the observed media effects on influence, in terms of the functions the media supported and how those functions were impacted by the information and cues afforded within the media. Thus, despite the fact that non-verbal cues per se accounted for a vast majority of the media effects on influence, the effects themselves were not manifest in direct proportion to the total cue-carrying capacity of the media. Instead, media differences were demonstrated as subjective, contextualized, and variable based on whether they helped or hindered particular communicative functions that provided a sense of: who

others were as individuals and as part of the group; what others were doing, what they were saying, and how they were thinking; and how the group could regulate and manage its own conversations, coordinated efforts, and collective attention. A more complete functional analysis of the media in this study will be provided in the section addressing Research Question 2.

4. Summary

A limited set of behavioral measures was selected to examine how communication technology might affect or change such behaviors employed during the course of influencing others. Results of the Phase 2 investigation indicate that the use of communication technology did not affect the expression of information-based influence messages, those that were concerned first and foremost with establishing or bolstering the persuasiveness of information itself. These findings suggest that communication technology did not introduce any perceptual effects for which those exercising informational influence believed they needed to compensate. Nor did it appear communication technology exerted any implicit effects on influence messaging behaviors. Therefore, the results lend credence the classical notions of informational power, indicating that influence generated by information may be independent of the means by which that information is conveyed or expressed. Other more socially, structurally, and relationally oriented influence messages were not expressed with enough frequency to facilitate analysis.

The depth of the data gathered during Phase 3 allowed for more perceptual assessments of how communication technology affected influence behaviors. Evidence strongly suggests that procedural influence messaging was affected by media; though it is unclear exactly how such effects were manifest in behavioral terms of message *expression*. Chat participants reported far more difficulties enacting procedural influence

than those in the voice conference; yet, such difficulties may have resulted in compensatory procedural messaging or a change in the pattern and types of procedural message expression rather than a total reduction of messaging behaviors. Procedural influence messaging difficulties were attributed to disruptions in conversational rhythm, limitations on how much information could be communicated per unit of time, and how the media inhibited sharing or orienting towards a common point or reference.

Moving still further past the operationalization of influence used for the Phase 2 analysis, it appeared that much of the participants' experiences of social influence were in fact perceptual and generated via non-verbal cues and contextual information rather than overt verbal behaviors. However, the perceptual experiences and outcomes associated with influence in the voice conference and chat conditions were contrary to expectations based on theories and perspectives presuming objective media characteristics simply filter out relevant social or non-verbal cues. A social information processing-based perspective was therefore proposed to account for the perceptual findings. Media differences were thus conceptualized in terms of the communicative functions they affected rather than the objective capabilities they exhibited.

B. RESEARCH QUESTION 2

1. Discussion

The second purpose of this study was to explore how communication technology might affect or change the communicative context in which influence messages were enacted and exchanged. As described in the composite system of representation (Figure 4), communication media, and thereby the technologies that support them, can affect the communicative context in a small group by altering the ongoing experiences, outcomes, and individual or collective perceptions of 10 different affinities, each one representing a

unique dimension or phenomenon associated with a group work setting. These affinities were described in terms of individual and group incentives and motivation; issues of group establishment and formation as *a group*; the assignment, assumption, or emergence of group roles; interpersonal relational and relationship issues; individual emotions and sense of the emotional states of others; logistics issues concerned with the beginning-to-end management and progress of the group's efforts; teamwork; synergy; task focus; and the final production or resolution of the group's efforts.

Assuming media characteristics are fundamentally objective and invariant along dimensions like social presence or media richness, the structure of the media or bandwidth afforded to signals and information relevant to those dimensions should produce predictable communicative and perceptual outcomes as a result of media use—regardless of context or user (Hollingshead & Contractor, 2002; Walther, 1992; Walther & Burgoon, 1992). As such, the precedence and placement of media in a perceptual system, such as the one produced in this study, should not indicate contextual impacts on media as a function of other affinities. However, the placement of the *Communication* affinity within composite system indicated that common perceptions of media were based on a web of interrelationships depicting action and interaction by and between elements of the context of media use, as well as the media themselves. Thus, the Phase 1 results are commensurate with adaptive structuration-like mechanisms where media perceptions and effects are constituted by and constitutive of situated media use (DeSanctis & Poole, 1994; Poole & DeSanctis, 1990).

Results of the Phase 3 interviews then provided a great deal of descriptive depth and breadth specifically regarding the mechanisms by which media impacted each element of the communicative context, as well as the perceived effects of those impacts. Moreover, within the context of the structured group experiences, media was perceived as

the most influential factor for determining the final outcome of the system, as well as all of the intermediary social processes that occurred within the task groups (Figures 11 and 12). These results suggest a very strong treatment effect for media on the perceptual and social processes occurring within the task groups—even if the behavioral measures indicated no significant differences between media.

The effects themselves were varied as described in detail throughout Chapter VIII; the depth of the perceptual data proved informative for explaining such effects in a manner that further contradicted some of the more classical and objective notions of media and media capabilities. For instance, experiences and sensations of an ineffaceable "presence" of others was perceived more strongly face-to-face than via the voice conference or chat, just as social presence theory suggests (Short et al., 1976). However, the notion of presence itself was only articulated in relation to the experiences of certain affinities, not throughout the entire system; nor was it perceived as an inherent or *prima facie* attribute of the media themselves.

The mechanisms for media effects on the *Final Product/Resolution* affinity were particularly informative for indicating why objective theories of media selection may have proven so popular over the years, yet are ultimately unsatisfying for describing a wider range of issues associated with media in use (El-Shinnawy & Markus, 1992; Lee, 1994; Markus, 1994a; Walther & Parks, 2002). Specifically, participants in each media condition perceived their group's final outcome as a direct function of the amount of information they could exchange and the efficiency they experienced doing so. Just as media richness theory predicts, as the number of verbal and non-verbal cues a medium supported (bandwidth) increased from chat to voice conference to face-to-face, the more participants could exchange information in a rich and efficient manner and the more positive the final outcome.

Thus, as a projective theory, media richness did indeed provide accurate and potentially useful information based on the success of the outcome or end state alone. However, as a theory of media in use, media richness or any other objective theory of media selection and use, would have difficulty accounting for the remainder of the perceptual differences between the chat and voice conference systems of representation. Similar to what was noted in the discussion of media and influence, the voice conference had obvious advantages in its information and cue carrying capacity over that of chat—a medium of much lower bandwidth. Hence, the voice conference should be preferable to the chat and result in better or more effective outcomes over the course of using the medium (at the very least, it should not have been any worse). However, the voice conference produced more negative and sub-optimal outcomes throughout the entire system of experience at all levels of activity and group organizing: individual (*Incentives/Motivation*), interpersonal (*Relationships*), and task-oriented (*Logistics* and *Teamwork*).

Finally, a bulk of the observed effects in the perceptual data was attributed to variations in non-verbal sensory and feedback cues between the technology-enabled media and the face-to-face setting. The greater the degree to which these cues were reduced or filtered by the media, the stronger the apparent effect. Findings were commensurate with those reported in Hollingshead and Contractor's (2002) recent summary of CMC research associated with the application of communication technology to group and collaborative contexts. Participants reported variations in their willingness to engage in communication with others, their perceived sense of anonymity or individuality, the individual and collective focus on task and instrumental aspects of the situation relative to group maintenance, their willingness to exchange negative or uninhibited messages, and their own consensus-seeking behaviors. Furthermore, as the

nature of medium further hindered the enactment or imposition of various social rules and norms regarding the structure and flow of the conversation, participants experienced greater difficulty understanding and following the discussions as opposed to the face-to-face groups (Straus, 1999; Straus & McGrath, 1994).

Together, these findings would seem to support the conclusion that technology-enabled media exert their effects on the communicative context by filtering social and relational cues, contextual and interpretive cues, and conversational regulatory cues (see Walther & Parks, 2002, for a more thorough discussion of the various "cues-filtered" perspectives). Again, however, any bandwidth-like perspective predicated on objective media characteristics would have difficulty accounting for the totality of the perceptual effects in this study; especially where outcomes in the higher-bandwidth medium (filtering less of these cues) were worse than those of the lower-bandwidth medium (filtering more). The chat's conversational trace, timekeeping, and common reference issues also did not seem to be linked to variations in non-verbal cues at all. Finally, it was demonstrated that the mechanisms by which media impacts were perceived on system affinities became more complex as the number of cues and modalities for expression decreased (Table 58). This particular observation indicates that some form of social information processing occurred as participants attempted to make better use of the media and capabilities they did have during the course of creating and negotiating social meaning, impressions, and experiences within their groups (Walther, 1992; Walther & Burgoon, 1992).

2. Implications

It is likely that communication technology can and does affect more than the 10 issues embodied by the composite affinities during the course of group interaction (as the discussions of influence have shown). However, these particular affinities were perceived

as *most* relevant to the experiences of group work by a large constituency of presumably reasonable people who have had numerous experiences in group work settings. Therefore, future research using a structuration-based framework for inquiry might direct a more pointed and focused analytical lens on the issues associated with the composite affinities.

Such an approach could help narrow the field of potential issues requiring attention to those most relevant to the context of situated media use under study. It may also illuminate issues relevant to ongoing media use that might not otherwise be closely examined because the explicit connection between the media and the contextual issues were not immediately apparent. From a practical perspective, the composite system provides a diagnostic tool or roadmap for intervention and improvement that could help troubleshoot specific implementations of a communication technology or information system, the work and social process and practices of the people who use them, or a combination of both depending on which relationships between affinities were implied by the difficulties.

Ideally, the structured group experiences would also have allowed for a controlled and systematic examination of the entire series of composite system relationships, i.e., how different media affected the other system affinities and how those affinities in turn affected experiences and perceptions of the media. However, participant reports during the Phase 3 interviews did not indicate any structuration-like feedback effects on media from the other system affinities. Either such effects did not occur, or they were not perceived to have occurred within the structured group meetings.

These results and observations from the Phase 3 interviews do not invalidate the composite system, nor do they necessarily imply that the objective theories of media and media use better describe the pattern of results. The experimental protocol, including time

limitations, training procedures, and the media treatment manipulation, may have simply decreased the complexity of the communicative context to a point where the feedback mechanisms depicted between the composite affinities did not have time or enough "interactive momentum" to exert any impact or alter any perceptions of the media in use (further discussion is provided in Section C, Subsection *2. Interpretive Observations*). Thus, while the Phase 1 composite system illustrated how situated media use unfolds amongst a contextual system of other affinities, the participant data from Phase 3 was still able to describe how preconceived or initial perceptions of media impacted the most important and most salient aspects of the communicative context (as they were created within this study).

3. Extensions

Given the unsatisfactory explanatory power of the objective characteristics and cues filtered perspectives, a new conceptualization of media and media capabilities was sought to help frame and organize resultant thought about the data. Such a conceptualization needed to afford media differentiation and description along relevant and meaningful dimensions of comparison. For instance, even though differences in cue-carrying capacity could not adequately *account* for all the perceptual findings, there is little doubt that the media *do* differ in their capability to carry any number and kind of cues at any given time. However, the social information processing perspective suggests that such absolute differences in capabilities between media are less important if the same functions those capabilities serve can be fulfilled through adaptive use of current capabilities, or compensatory use of other capabilities.

The notion of media functions was introduced in the discussion of influence and served to re-frame the perceptual results from Phase 3. Specifically, the mechanisms for causation and effect between each medium and the other system affinities (Table 60)

were analyzed for the communicative functions the causal mechanisms seemed to support. Three such functions were evident in the data: social awareness, interactivity, and propinquity. The functions themselves were borne of more objective capabilities such as capacity, modality, and synchronicity, but are not necessarily continuous based on the amount or degree of the underlying capabilities.

The most pronounced functions the three media supported were social in nature and included the three media's overriding accountability concerns, the ability to read and interpret others' reactions, and various perceptions and effects relating to presence. All of these mechanisms for perceptual effect seemed to be related to the same communicative function of creating *social awareness* within the group. To ensure such a function was not arbitrary, the notion of social awareness was drawn from an amalgam of concepts appearing in CMC and human-computer interaction design research including social bandwidth (Barry and Fulmer, 2004), social translucence (Erickson, Smith, Kellogg, Laff, Richards, & Bradner, 1999; Thomas et al., 2001), and sociable media (Donath, 2004).

Social bandwidth is a capabilities-based concept that includes the diversity of cues a medium is capable of supporting that ultimately provides for psychosocial perception of social differentiation and relationships between participants. Social translucence is a descriptive term that indicates the degree to which a medium provides perceptually based social cues about the presence, orientation, and activities of others. Thus, socially translucent media and systems are those that allow people to be attuned to the presence of others (e.g., last login time), become aware of their activities (e.g., what files have been accessed), and perceive a sense of accountability based on the mutual awareness of both parties to each other's presence and activities. Sociable media are those media that enhance the communication and establishment of social ties, the key

component of which is identity information—information that which we care about for how others perceive us, and information we use to understand and interpret the words and behaviors of others. Together, these concepts encompass all of the socially oriented functions that the media served to varying degrees of efficacy within the Phase 2 task groups.

The second communicative function evident in the perceptual results concerned the participants' sense of how much could be said or conveyed at any one time (verbal bandwidth), and how the medium affected the timing, structure, and rhythm of the conversation. In the case of the face-to-face participants, non-verbal cues served the regulatory functions necessary for conversation to proceed. The voice conference and chat not only filtered or removed some of those cues; they imposed or introduced new regulatory cues and capabilities. Verbal bandwidth was distinguished from notions of information richness in that the affordances or limitations of a medium's verbal bandwidth were never articulated in terms of what could be appropriately communicated to others via the medium. Instead, participants indicated that verbal bandwidth simply affected—in a mathematical sense—how much participants had time to communicate.

Participants' descriptions of the effects of verbal bandwidth and the various issues associated with conversational rhythm and structure closely matched the concepts of interactivity (Barry & Fulmer, 2004; Rice, 1987) and media rhythm and format (Donath, 2004). Interactivity encompasses the temporal elements of a communicative exchange including the rate of message transmission and the speed of feedback from others. In addition, interactivity includes a sense of synchronicity and describes the pattern of responses the form of the medium affords, that is, a measure of the various signals or cues that give rise to coordinated turn taking or independence of action in time amongst participants. Rhythm also refers to the synchronicity and speed of exchanges and

describes how such media affordances affect communicative style including the degree of control over the timing of responses and the length or bulk of information conveyed in each message.

Format indicates the symbolic representation of information itself, e.g., text, sound, and images. For instance, whether someone agrees with another can be signaled through a number of different formats; by head nod or gesture requiring a moving image, a static image or icon requiring pattern recognition, or a verbal confirmation that requires either sound or text display, each of which also necessitating additional time and effort for language processing and comprehension. Thus, the format of a message can affect the pattern of responses arising from media use because different responses, timings, and conversational rhythm are required to perceive and respond to messages rendered in each format. Thus, the notion of *interactivity* as a communicative function is conceptualized as the literal processes and means by which individuals can convey their intended messages, as well as the perceptual processes that govern the style, rhythm, and timing of communicative exchanges.

The final communicative function served by the media in this study was to facilitate perceptions of a sense of place or "habitat" for ongoing activity—one that was both an arena in which interaction occurs and a medium for expression and communication (Ducheneaut & Bellotti, 2001; Shockley-Zalabak, 2002). A similar concept that most closely aligned with the remainder of the perceptual findings was *propinquity*. Korzenny (1978) described propinquity as nearness or salience in both space and time, and as the most basic condition for our senses to capture features of our environment, i.e.,

> We impose the dimensions of space and time on everything that is accessible to our senses so as to make the categorization of objects of knowledge possible… space and time, as physical dimensions, determine

> not only the way in which we know and what we know, but, more fundamentally, the possibility of knowing at all (p. 4).

The Phase 3 discussions of common reference and timekeeping issues strongly indicated that the media affected such a sense of how near or knowable the small group environment was as a place in space and time. For instance, the more salient or "place-like" the environment was in supporting group work, the easier it was for participants to share a common reference amongst each other. This was especially true face-to-face, but also in the chat to a certain degree because the conversational trace was a very immediate, "perceptually close" resource that visually and persistently reinforced and reaffirmed the participants' efforts over time.

Similarly, the participants' comments during the interviews suggest that the more explicit a sense of the passage of time was made via the technologies supporting the medium, the greater was the sense that everyone was "in it together," a metaphorical, place-like reference indicating that through the communicative process, individuals sensed they were working within the same context, subject to the same constraints, and striving to achieve the same goals. The persistence in time and space of the place created by the medium would also account for presentation issues expressed in the chat condition. Specifically, the greater the persistence of the communicative exchanges over time, the more one would likely be to concern themselves with presentation of the intended messages because the more likely it would be those messages were reviewed or accessed by others—even those outside the original context in which the message was rendered.

Thus, the face-to-face medium provided a pronounced sense of propinquity because all the participants were collocated; they could share notes, drawings, or other persistent traces of their activities. The voice conference clearly reduced the sense of

propinquity as evidenced by the many comments of disconnection and depersonalization; conversations were also transient and non-persistent and individual notes regarding the group's decisions or activities could not easily be shared. The chat appears to have fostered a greater sense of propinquity between group members than the voice conference because the medium itself provided a salient and persistent sense of place in which communication and interaction could occur—especially evident in chat's effects on the *Logistics* and *Teamwork* affinities.

The chat was even described during the interviews in terms of being a unique place—somewhere special or distinct that had been set aside for the sole purpose of completing the task. This greater sense of propinquity would also help explain why the chat, though offering the fewest non-verbal cues and sensory information to work with, could also produce fewer negative results throughout the system of affinities than the voice conference. Therefore, the degree to which the media limited or enhanced the formation of a sense of propinquity accounted for the remainder of the mechanisms for effect that were attributed to each medium.

From a theoretical perspective, a functional approach to understanding and examining media requires a shift in epistemological thinking and research away from some of the more predominant theories of media selection and use. For instance, the communicative functions of social awareness, interactivity, and propinquity are undeniably subjective, contextual, and socially constructed. Though more classical notions of bandwidth or objective capability are subsumed within the three proposed media functionalities, it is not clear whether affordances made for these functions would necessarily improve more basic outcome-oriented or technology-specific issues such as of efficiency or utility.

The composite system of representation certainly implies that designing communication technologies to support such functionality has the potential to create positive outcomes related to the conduct and context of group work, i.e., the 10 other composite affinities. However, the theoretical efficacy of the functional perspective has yet to be established. For instance, would increases in communicative functionality along these three dimensions also produce behaviorally relevant outcomes—perhaps a marginal increase in user acceptance; or would they simply make the act of use more socially engaging and rewarding?

Such behavioral concerns are not trivial given the price of information and communication technologies and the growing number of media alternatives for supporting collaborative work and communication. Nor should the potential contribution of socially relevant functionalities be underestimated as the recent boom in the popularity of social networking sites and applications will attest. Such socially relevant communicative functions may help provide new avenues for knowledge generation and distribution by providing access to shared knowledge and managing information about the people who produced it (Thomas et al, 2001).

Consequently, the functional perspective that emerged from the media effects and outcomes in this study provides a powerful set of design principles rather than a theory of media use per se. The functions themselves were based on a series of relationships between media and the context of use that were deemed most important and most relevant by media users. Therefore, the evidence suggests that media improving or providing high levels of interactivity, social awareness, and propinquity should produce perceptually relevant improvements in the experiences of the media themselves, such as usability, as well as perceptions related to the task or group outcome such as satisfaction or commitment. Additional interpretive, behavioral, and ultimately factor analyses would

likely be required to determine exactly what sorts of *specific* technology features or capabilities would necessarily improve a medium's functionality relative to interactivity, social awareness, and propinquity.

Nevertheless, a functional perspective does provide practitioners and designers with indications as to where such attention should be directed depending on which aspect of the context of media use one wishes to affect. For instance, if synergy in group work is desired to produce potentially more creative or integrative ideas, employment or design of a media that better supports interactivity is suggested based on the obtained results. Similarly, a medium that improves a sense of propinquity, perhaps through a shared whiteboard or notepad, is advisable if logistical concerns are likely to prove problematic or necessary over the long term.

In some instances of course, such intervention or consideration of communicative functions may not be needed or desired. Limitations in social awareness can help eliminate some problematic relational issues; as one participant noted, the chat "took the human part out of the equation" and let the group simply focus on the task. However, for those who are interested in reducing ambivalent media perceptions and experiences and driving more of the system affinities to positive outcomes, the following list indicates the media issues or concerns that were associated with each of the three communicative functionalities. Design attention or usage strategies should ideally be devoted to improving or making a particular issue more explicit or more accessible to media users whether such availability is afforded by a technological or a procedural intervention.

1. Interactivity: verbal bandwidth/throughput; ability to exercise control or enact social and formal rules governing the structure, flow, and organization of the conversation; formatting assistance for message presentation that facilitates positive reception without increasing "cognitive load" of composing and expressing a given message.

2. Social Bandwidth: accountability to others; sense that others are accountable to group; reactions of others; sense of what others are attending to; variety of cues that help improve sense of "presence."
3. Propinquity: common or sharable reference; persistent conversational trace; timekeeping functions.

4. Summary

Contrary to objective or a priori conceptions of media and media use, the composite system of representation produced during Phase 1 indicated that perceptions and experiences of communication media are situated within a structuration-like series of relationships between the media and other elements of the communicative context. The composite affinities produced during Phase 1 described 10 such elements that provide a set of boundary conditions for future study and analysis of situated media use. The structured group experiences administered during Phase 2 failed to produce a rich enough context for media use to explore such structuration-like relationships between the context of media use and the media themselves. However, the Phase 2 group experiences were successful in creating a context of media use that highlighted the nature of the direct relationships between media and the other system affinities.

Based on the perceptual results of the Phase 3 interviews, the specific effects technology-enabled media produced within the communicative context were consistent with other relevant research findings concerning the potential impact of communication technology on group communication and outcomes. However, the mechanisms for such effects could not be accounted for by objective conceptualizations of media, including social presence and media richness, or by bandwidth limitations of relevant non-verbal and sensory cues. However, the relatively small and nearly identical number of issues that were attributed to each medium and its effects suggested a different level of abstraction was necessary to interpret how the media impacted the communicative context in this study. All of the perceived mechanisms for media effect and causation

reported during Phase 3 were therefore re-interpreted in terms of the functional perspective of media that was suggested by social information processing theory.

The resultant communicative functions included interactivity, social awareness, and propinquity. These functions accounted for the stable, meaningful, and pre-conceived notions participants held about all three communication media as described at the beginning of the interview segments. However, they also accounted for perceptual adaptation, subjectivity, and contextualized enactment of those functions as implied by the numerous ambivalent outcomes of the chat relative to the negative outcomes of the voice conference.

The composite system of representation indicates that improvements or informed use of media supporting such functions can have widespread impact on virtually every relevant aspect of the collaborative group work setting. The theoretical sufficiency of interactivity, social awareness, and propinquity for explaining or predicting other relevant behavioral and perceptual outcomes has yet to be established. However, the functionalities themselves provide media use and media interface design criteria that are likely to improve socially and individually relevant perceptual outcomes including satisfaction, commitment, or usability.

C. METHODOLOGICAL ANALYSIS

1. Composite Perceptions and Structured Experiences

Much of the literature discussed in the second chapter—whether pertaining to influence, technology use, or a combination—centered on action and interaction situated within a larger social context. The composite system described in Phase 1 defined 11 elements that were important and relevant to the context of small group experiences. Given the complexity of the issues surrounding influence and technology use within that

context, a number of methodological decisions and manipulations were employed to help create a controlled but viable context in which to examine such phenomena.

First, the Phase 2 structured experiences were conducted in small groups with enough others to (theoretically) elicit some emergent feelings of "groupness," or at least that the actions and interactions of interest would transcend simple transactional exchanges between individuals. Second, Phase 2 was conducted over time to help provide a sense of expectation and persistence of social context that would last beyond the 15 minutes of each meeting. Finally, participants were provided with a short group and technology orientation as well as ongoing social time during which they were free to develop whatever social context and relationships they wished (if any at all) outside of any direction or immediate influence from the principle researcher.

Figure 17 provides a bird's eye view comparison between the composite (top) and participant (bottom) systems of representation and experience.

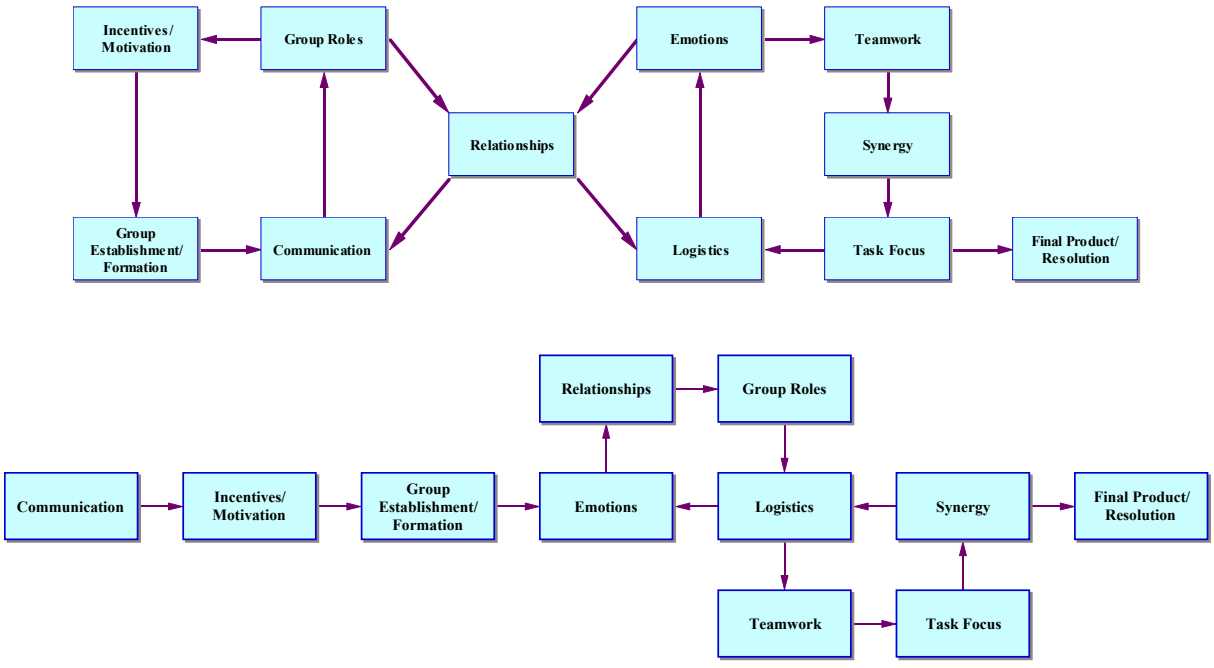


Figure 17. Graphical Comparison: Composite (Top) and Study Participant (Bottom) Systems

The physical dissimilarity suggests that perhaps the measures taken to enrich the communicative context within the structured group experiences were not entirely successful. For example, the composite system is almost entirely circular, indicating structuration-like mechanisms of constituted and constitutive perceptions for virtually every system affinity. The participants' system was more linear at the outset, indicating some deterministic thinking and less ambiguity regarding the role the three driving affinities played in the overall system of experience.

However, some of these differences begin to break down upon closer inspection of affinity precedence and placement. For example, both systems end definitively with the *Final Product/Resolution* as a function of the values and interactions between other affinities. Thus, neither the composite nor participant systems indicate that perceptions about the final product directly impacted perceptions about other affinities; the *Final Product/Resolution* was a destination in and of itself rather than a part of the journey. Similarly, by following the direction of influence through the composite *Communication* affinity after it most immediately interacts with *Group Roles*, the order of precedence in the first feedback loop also perfectly matched that of the driving affinities in the participant system: *Communication* to *Incentives/Motivation* to *Group Establishment/ Formation*. Both systems were essentially perceived as being "launched into action" through the interaction of the same factors.

The composite system also indicated that *Group Roles*, *Logistics*, *Emotions*, and *Relationships* were tightly coupled within feedback loops residing in the center of the system. The placement of these affinities suggests that upstream issues like *Communication*, *Incentives/ Motivation*, and *Group Establishment/Formation* can impact a person's perceptual movement through or experience of *Group Roles*, *Logistics*, *Emotions*, and *Relationships* as they work their way into or out of the feedback loops. A

4-element feedback loop comprised of *Group Roles*, *Logistics, Emotions*, and *Relationships* also appears at the center of the participant system. The fact that these loops are not laid out in the same precedence order is not necessarily problematic. Feedback loops also graphically illustrate the ambiguity of thought and interaction of perception between tightly coupled affinities, i.e., A influences B, but B also influences A through the mediation of C. Therefore, whether a loop is depicted as A-B-C-A or A-C-B-A, the intermediate experiences and perceptions within the loops of the composite and participant systems were perceptually equivalent.

Finally, the last three affinities to most directly affect the final outcome of the composite system were *Teamwork*, *Task Focus*, and *Synergy*—the same three final affinities that influenced the outcome of the participant system. Both systems indicated that these three relative outcomes were included in a feedback loop that impacted the *Logistics* affinity which translated their perceptual effects and outcomes back upstream to the intermediate and driving affinities. Results indicate that the study participants' experiences and perceptions of the structured group experiences were very similar to the composite system of representation. Figure 18 illustrates these points and perhaps throws into sharper relief the similarities between the two systems.

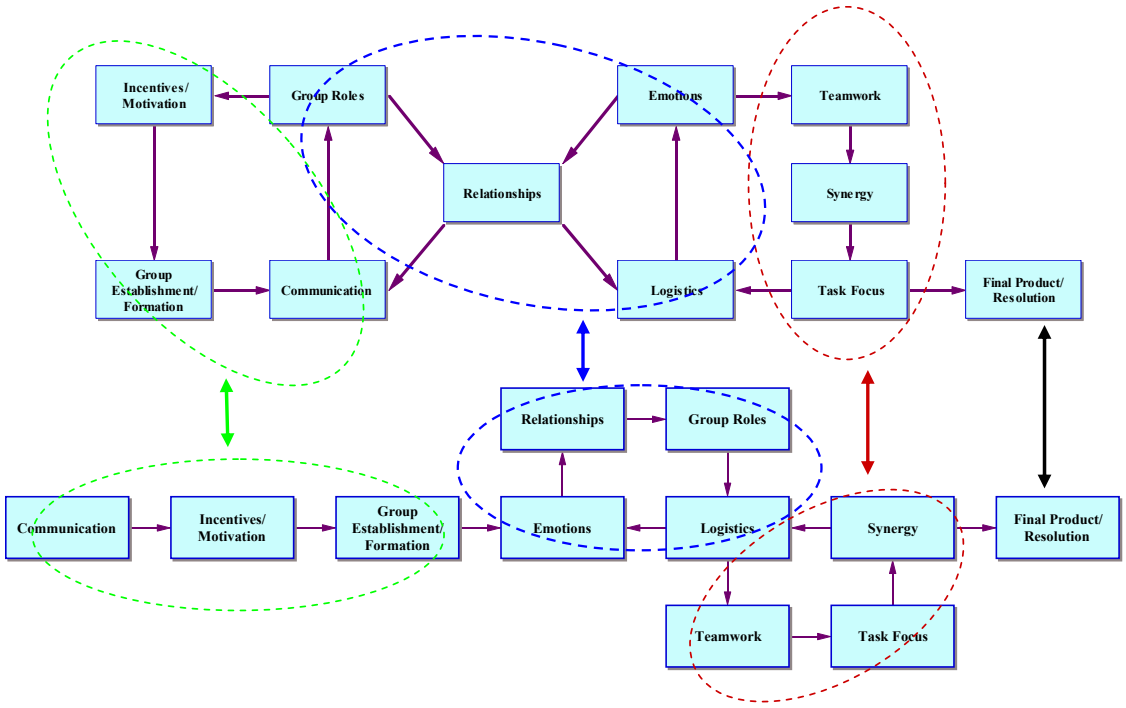


Figure 18. Similarities/Equivalence: Composite (Top) and Study Participant (Bottom) Systems

Such similarities were not an artifact of applying the IQA methodology; there were no guarantees that the voting, math, and cutoff decisions in the Pareto protocols would necessarily produce similar systems. The study participants' system could have been completely linear had they perceived their experiences to be so. Every affinity identified and described during Phase 1 was also not necessarily assured of inclusion in the participant system had the perceived relationships between affinities not exceeded the cutoff value. Finally, the precedence of the affinities within the participant system might have been so dramatically different from the composite that one could argue the two were not describing the same phenomenon. However, the marked similarities and equivalences between so many parts of the two systems provide some indication as to the sufficiency

of the methodology for creating a suitably rich and complex communicative context for examining issues of interpersonal influence and situated media use.

For instance, the feedback loops indicate that the intermediate perceptions and experiences of at least seven different affinities could or did change over time as the participants' efforts were organized and executed during the structured group experiences. Such changes were perceptually similar, in terms of variability and interaction with other factors, to the kinds of relationships and outcomes one would expect in real-world contexts, just as the composite system described them. Indeed, had the structured experiences been *too* artificial or unnatural, it is reasonable to expect that the perceptions and experiences of the system affinities would not have been as variable or contingent on so many other affinities as they were perceived to be.

2. Interpretive Observations

Nevertheless, the three driving affinities of the participants' system were perceived in a linear and therefore deterministic fashion. Using statistical terminology as a metaphor, it is possible that the study participants' perceptions and experiences during Phase 2 were the same as the composite system described; however, the additional feedback loop driving the composite system may not have been detected due to a lack of power. Specifically, the composite system was based on more than twice as many combined votes as the study participants' system. A few more participants (or groups of participants) might have better fleshed out some of the more complex and ambiguous relationships indicated within the composite system's feedback loops.

In fact, an affinity pair that appeared one vote below the cutoff of the study participants' Pareto protocol was a link between *Incentives/Motivation* back to the *Communication* affinity—a relationship that would have created a feedback loop between the three driving affinities and ultimately rendered the composite and participant systems

perceptually equivalent. Thus, some of the complex relationships identified in the composite system might have been depicted as direct relationships simply because not enough votes were cast to detect the feedback loop. Similarly concerning the first research question, it is possible there was not enough power in the small per-cell *n* to detect any significant effects on influence messaging due to media. However, this limitation was inherent to the overarching research objectives of examining on-going activities and influence processes within *small* group contexts and was therefore unavoidable.

Assuming a lack of power was *not* responsible for the results of the participant system, the linearity can be interpreted as less perceived ambiguity in the relationships between driver affinities and the rest of the system where the real-world perceptions and experiences were otherwise more complex. For instance, the *Communication* affinity appeared in the composite system as a relative driver, indicating that the meaning and use of a particular medium is commonly perceived as contingent upon other elements within the context of use. Because this same affinity appeared as a primary driver in the participant system, the results indicate that the structured group experiences may have increased the *salience* of the many direct effects between media and the other elements of the context of use while obscuring the feedback or structuration-like mechanisms that could alter such perceptions through the course of group interaction.

The time limits of the tasks may have reduced the degree to which such complexity of thought about the media could develop. Social information processing research has demonstrated that the passage of time is necessary for groups employing technology-enabled media to fully adapt the cues and capabilities left to them in order to develop social impressions on par with those of face-to-face groups (Walther, 1993; Walther & Burgoon, 1992). There is no reason to assume that such impressions are

necessarily limited to other individuals. The passage of time may also be necessary to fully develop impressions of media in use, as well as how other elements of the communicative context impact those media.

It is also possible that training the participants on the use of the various media before assigning them to a single media condition may have sensitized them to the relative differences, advantages, and disadvantages between the three—perhaps more so than if they had freely selected a medium themselves. Evidence of this effect was observed during the interviews in that the capabilities and impacts of one medium were routinely described in terms of the others. Such a sensitizing effect seemed especially pronounced for those who had never conducted a voice-conference at all, or who had never tried working in a small group via chat.

The *Communication* affinity's placement in the participant system was thus interpreted as an increased emphasis or salience on the role media played in the perceptions and experiences of group work resulting from the time constraints of the structured group experiences, the pre-treatment training procedures, and the treatment manipulation that limited participants to a single medium for all three tasks. The interpretive impact of these factors was that the *Communication* affinity could not be examined within a larger, structuration-type framework of media use (as it was depicted in the composite system) because participants did not perceive the rest of the system affinities as exerting any meaningful impact on their media perceptions and experiences. However, because participants *did* perceive that media directly affected *all* relevant aspects of the communicative context, the structured group experiences provided a focused setting for more directly examining factors relevant to the second research question: how communication technology affects or changes the communicative context.

The remainder of the linearity in the participant system was accounted for by the *Group Establishment/Formation* and I*ncentives/Motivation* affinities, suggesting that the structured group experiences did not provide for all of the complexity of thought and experience normally associated with these issues. For example, given the fairly large monetary incentives and a voluntary participation, the participants in the structured group experiences were probably quite similar in their individual experiences and valences of the *Incentives/Motivation* affinity even before the tasks began. Participants may also have been so similarly and strongly motivated that any changes in the other system affinities were not "strong enough" to create any feedback and thereby affect ongoing motivation for participation and task completion. Though not formally a part of the participants' system, incentives and motivational issues may have affected processes of interpersonal influence, including those responsible for the behavioral findings (motivational issues relating to influence behaviors are further addressed in *3. Limitations*).

A seemingly wider range of perceptions and experiences was associated with the *Group Establishment/Formation* affinity within the short-lived communicative context of the structured group experiences. Perceptual reports indicated participants were responsive to social differences based on age and experience and in-group/out-group distinctions based on academic programs. Roughly one third of the participants were classmates, friends, or roommates with at least one other person in their group. A few closer interpersonal relationships even developed over the course of the study; six participants who were prior strangers reported spending dinner together or going shopping after the group meetings.

The interview protocol also included probes for the group's activities during the social time before each task and general perceptions about the group that may have changed over time. Expressed sentiments were virtually unanimous; the additional social

time and repeated group meetings helped participants become more comfortable in their groups, added depth to their personal knowledge of fellow group members, and established expectations for group work and working relationships. Evidence of the positive social and contextual effects of these measures was also observed in the participant accounts of downstream affinities such as *Relationships, Emotions, Group Roles,* and elements of *Teamwork*.

Thus, the in-depth comparisons between the composite and participant systems indicated a good deal of perceived and experienced similarity between small group environments created in this study and those of more complex, real-world settings described by the focus groups' data and the composite system. Some of these similarities may have been attributable to the deliberate measures incorporated into the experimental protocol to enhance the richness and complexity of the social environment. However, the study's design and implementation also seems to have affected perceptual and social processes that occurred within the task groups themselves. Recruitment procedures may have increased homogeneity in incentives and motivation which not only affected other system affinities, but most likely processes of interpersonal influence as well. Media perceptions and experiences also exhibited less contingency on the contextual impact of other affinities; however, the reduced complexity of thought also made for more direct assessments of how media effects were perceived on other affinities. Additional limitations that do not focus explicitly on the perceptual system are discussed in the following section.

3. Limitations

a. Measures.

Participants reported socially and relationally relevant media effects on influence even if the associated behavioral measures produced no such data or indicated no such effects. The perceptual results thus cast some doubt as to whether a behavioral study of influence based on message *expression* alone is sufficient to explore how different media might affect the processes of influence in general. Some estimate of the perceived impact or success of the influence message, rather the expression itself, may be necessary to better appreciate any latent or emergent media effects on influence, e.g., Zigurs et al.'s (1988) measures of total procedural influence messages as well as perceptual ratings of prominence and achievement.

Similarly, it is possible that the seven key influence messages are commonly used or commonly understood influence strategies; yet, they may not be commonly *expressed* in the course of conversation. Indeed, the "influence potential" of a particular influence message may have little to do with how often such a message is used—a conclusion partially supported by the perceptual reports in that many of the factors comprising experiences of influence were non-verbal in nature. Thus, part of the reason so few studies have examined the choice of influence messages as a function of communication media may be due to the fact that specific influence messages are better projective measures of influence strategies, i.e. how likely you are to engage in this type of influence behavior, rather than behavioral measures of influence.

b. Tasks.

Task type was not deliberately controlled as part of the study. Thus, there is no way to know definitively if the type of task per se—as it appears on the task

circumplex—was actually responsible for the lack of differences in influence messaging behaviors rather than something fundamental about informational influence. The tasks themselves may have been so similar that the same "amounts" of influence behaviors were required to complete them regardless of any potential media effects on the resultant influence behaviors. This particular conclusion seems unlikely based on the perceptual reports; participants commonly indicated that the first task was the most fun, the second task was the most dry and uninteresting, and the third task was the most compelling for its moral and ethical issues.

However, the tasks themselves were independent which may have altered the *ongoing* processes of influence within the group. For instance, the outcome of the environmental improvement task or academic misconduct case did not depend on the first day's decisions regarding which items would be kept for survival in the desert. Thus, the independence of the tasks may have altered the degree to which influence messages were expressed during each meeting because the contextual structures around which those messages were constructed kept changing. It is possible that a single task requiring coordinated effort over the course of the entire study might have elicited more of the target influence behaviors because the final outcome would have been more dependent on the results of each day's activities and interactions.

c. Motivation.

A composite affinity analysis of *Incentives/Motivation* was conducted to determine whether participants may have simply acquiesced to the demands of the study. Nearly all participants indicated they knew they could simply show up, do nothing, and would still be paid, though none indicated they seriously considered doing so. Instead, a wide variety of motivational factors was expressed that encouraged not only participation in the study, but to actually do a good a job on the tasks themselves. These included

extrinsic factors such as monetary incentives, extra course credit, or class assignment material. Yet, despite the rather large monetary incentive, the bulk of the responses centered on intrinsic incentives and motivational factors. Such factors included the participants' own interest and enjoyment stemming from the research setting, the tasks, or the group's interpersonal processes and interactions in general; feelings of sympathy or identification with the principle investigator; and character-centric issues such as work ethics or feelings of obligation as well as a desire to challenge and prove oneself. Only one participant out of 23 admitted she was not particularly motivated during the study.

However, even when accounting for the reportedly high degree of investment and interest in the outcome, participants suggested experiencing malleability or conciliation partly due to social norms associated with unfamiliar settings and working with relative strangers, and partly because there were no real consequences associated with the group's outcome. As a result, common sentiments suggested participants were on their "best behavior" and concern was voiced for keeping the group experience itself positive and flowing smoothly rather than exerting or imposing one's own will on others. This is not to say that participants did not care whether they did a good job; only that the limited expression of "harder" or more Machiavellian influence strategies such as ingratiation, coalition tactics, or pressure and assertiveness may have been the result of a motivation borne of concern for the group as a whole rather than task success.

d. Sampling and population.

The recruitment of volunteer graduate and undergraduate students for all phases of the study, and the prototypically academic issues that were embodied in the composite affinities, undoubtedly raise concerns of external validity. Such concerns stem from whether university students differ in some fundamental way from those in society at large when it comes to the way they work together, relate to others, influence each other, and

use communication technology in the course of doing so. In this respect, the composite affinities seem to demonstrate a good deal of face validity—one might be hard pressed to think of many other issues that would play as large a role in a small group experience that weren't already accounted for in the composite system. Popular conceptions may also suggest that university students are likely to be more "tech savvy" than those in other organizational settings and therefore might respond or acclimate differently to the use of communication technology. However, the chat and voice conference are fairly simple and common media alternatives used in the modern workplace where computer mediated and virtual group work settings are becoming more the norm. It is therefore likely that media experiences and perceptions would be similar in other settings.

In terms of patterns and processes of influence however, the sampling popular may threaten the applicability of the results to other contexts. For example, participants indicated they were implicitly sensitive to differences in age or academic standing. However, there are very few explicit or formal reporting relationships and structural hierarchies between students of different academic programs. Were this same study conducted in a military or business setting, where hierarchical differentiation is explicit and culturally reinforced, processes of influence might have been enacted quite differently. One would expect such differences to manifest themselves as variations in influence behaviors, possibly even in terms of media effects on those behaviors, precisely because those a priori social structures and formal hierarchies naturally imply differences in influence potential that were not present in the student study groups.

e. Messaging intentions and coding.

Coding for each influence message type was limited to explicit passages from the transcripts that matched exemplars of influence messaging behaviors drawn from relevant literature. However, without perceptual clarification as to participants' intentions

concerning *particular* exchanges, it is possible that the transcript coding included a number of inaccuracies. For example, it might be difficult to discern from text alone whether a passage that looked like a consultation or idea support move truly was a case of someone enacting a specific influence strategy in a conscious attempt to influence others; or if they were simply seeking clarification about an idea for which they themselves were ambivalent. Similarly, a compliment such as "good idea" or "good job" could be a form of ingratiation in the sense of purposeful influence-seeking behavior, or it might simply have been part of the social niceties and relational expectations typically expressed in the unfamiliar but predominantly cordial and professional atmosphere described in the participant comments.

Such difficulties underlie virtually any content analysis of social interaction based on nothing but the verbal exchanges alone, especially given the degree to which non-verbal cues and information figured into the perceptual system. One way to remedy such concerns might be to adopt a different coding scheme based on sequential and dynamic exchanges rather than isolated utterances (Weingart, 1997). In addition, participants might be approached to provide an interpretive content analysis of their own conversations, i.e., indicating which specific passages or exchanges might have been expressed for the purposes of influence at the time.

f. Captive use.

Captive media use during the structured group experiences represents a potential threat to internal validity. Participants were given no *choice* except to use one particular medium which may have somehow dramatically altered the normal influence processes the participants would otherwise have perceived or enacted with others. Given the generally short time available in experimental settings to avoid fatigue or subject loss, captive use is often the only means of ensuring the media of interest will actually be used

in context during a study. Moreover, the commonality of technology-enabled media coupled with increasing physical dispersion in modern organizational settings may enhance external validity as a tradeoff, i.e., face-to-face may indeed be preferred in some instances, but time, distance, or other factors make the selection or preference itself irrelevant—another medium must still be used and hence, the preferences of use become secondary to the issues of actual use. Finally, it has been suggested that studies employing captive use can exacerbate the issues or impacts associated with technology use during group interaction (Straus & McGrath, 1994). Evidence this was the case during the study was discussed briefly in Section *2. Interpretive Observations*, indicating that captive use afforded a perceptually and perhaps behaviorally more extreme data set for addressing the research questions and study objectives.

D. DIRECTIONS FOR FUTURE RESEARCH AND ANALYSIS

The work accomplished to date leaves much room for exploration and improvement. For example, additional analysis in other organizational contexts and other media user populations would provide an indication as to the comprehensiveness of the communicative context as depicted in the composite system of experience and representation. Specifically, how universal are the composite affinities to the conduct of group work? Assuming a relatively stable set of affinities emerged from multiple user groups, such results would help define a set of manageable boundary conditions that would address some of the scope of inquiry concerns when using an adaptive structuration-like approach to study situated media use.

Furthermore, using the protocol and composite affinities already established, interviews could be conducted with field users of various communication technologies to better explore the meaning and nature of those technologies in situated contexts of use rather than under strictly controlled conditions of captive use. Such inquiry could

examine and describe the mechanisms by which the other affinities comprising the communicative context feed back to affect perceptions and experiences of media, rather than the unidirectional relationships described in this study. Indeed, given the situated and contingent nature of media use and perception that the composite system implies, media effects research should begin to focus more attention on how such effects might actually be constituted by other elements of the context of use, rather than a result of inherent media properties exerted on those elements.

Modeling a system of representation for each medium, rather than the communicative context in which they are used, might provide even more fidelity and granular understanding of the three proposed media functions, or how particular aspects of communicative function affects an individual's perception of that medium as a whole. For example, how important are functionalities for supporting interactivity, social awareness, and propinquity in relation to each other? How are such functionalities related to other relevant group outcomes such as satisfaction, performance, and commitment? At present, such linkages are only inferred based on perceptual reports and the affinity analyses; it is unclear whether improvements in such functionality will necessarily produce better outcomes system-wide, or if those functionalities alone are enough to affect changes in the individual system affinities. Finally, all the media in this study were synchronous or nearly so; would the notion of interactivity still account for the observed perceptual and behavioral effects if an asynchronous medium such as e-mail, a bulletin board, or memo, were used to conduct the same sorts of activities?

Answers to questions like these might help indicate how to invest additional development time and effort to improve a medium's functionality in a particular area, or if a compensatory move might be made to address deficiencies in functionality that do not involve changes to the medium itself, e.g., training, formalized procedures for use, or

cultural changes regarding how a medium is perceived by the using population. Additional interviews and theoretical coding might also provide more information about explicit, rather than inferred, linkages between particular functionalities and a single affinity of interest, i.e., perhaps one is only interested in technology's effects on relationships, teamwork, or the final product.

Additional questions also remain about the behavioral indices of influence given the lack of all but informational influence messages in this study. For instance, if such measures were to be examined again in a structured or controlled fashion, a performance-based reward system might be employed to increase motivational factors beyond group maintenance issues. Intact groups might be used to provide a social context for influence in which others may have some control over resources or relational outcomes that others desire, or a relational structure or hierarchy to provide additional context and potential for interdependence. These factors might allow the processes of social influence to more fully develop within controlled settings along the dimensions embodied by the seven key influence measures.

However, perhaps procedural influence is a more appropriate behavioral measure for examining the effects of media on influence. The transcripts of the task groups might be recoded for procedural influence messages to examine whether behavioral data matches with the perceptual reports regarding media differences and procedural influence. An index of message success or compliance could also be incorporated into the examination to test for significant differences in perceptual or outcome-oriented measures that influence messaging behaviors.

It would also be informative to investigate what other forms or types of communicative behaviors were sacrificed during the discussions to maintain relative levels of informational influence messaging between media conditions. A content

analysis of the task group transcripts might reveal additional themes or commonalities in group maintenance or task-related behaviors that are relevant to the study of media effects, or to other influence processes within small groups. Perhaps if any shortcomings or deficits in certain helpful behaviors can be identified between media, steps can also be taken to correct the disparities and bring the effectiveness and outcomes associated with "leaner" or "impoverished" media more in line with the positive effects enjoyed in face-to-face discussions.

Finally, the present investigation highlights a very important issue relevant to the current rush towards media and technology convergence. It has been demonstrated that it might not be necessary to make our "virtuality" as sensory-capable and cue-rich as our reality if the *proper* cues and *relevant* information are incorporated into the functionality of the media. In fact, many of the perceived shortcomings associated with certain media may be overcome by informed use, or through procedural, cultural, or institutional changes, rather than any explicit efforts to improve the media or technologies themselves. However, if a few simple devices and additional functionalities can help improve social awareness or a sense of propinquity, people may well adapt to the lack of other sensory information affecting interactivity that are normally available in face-to-face settings. Thus, the functional approach to media conception may be useful to help focus attention on how we can yoke the strengths of each media in accordance with the context of use, rather than expend so much effort trying to overcome their weaknesses and deficiencies.

Appendix A: Interactive Qualitative Analysis Methodology

I. INTRODUCTION

An overview of the IQA process will be presented in the following pages for methodological transparency regarding how the method itself is conducted and the resultant data analyzed and interpreted. Significant portions of this section were used with the permission of Doctors Northcutt and McCoy, co-authors of the IQA methodology. Additional notes were culled from materials generated or provided during attendance in an IQA research methodology class.

The purpose of an IQA study is to allow a group to create its own interpretive "map" of a phenomenon or issue and then construct individual "maps" of meaning: together, the two levels of meaning are used by the researcher as the foundation for interpretation. The "map" is represented as a system of components held together by relationships among components. Thus, an IQA study prompts participants to examine a phenomenon important to them in terms of the following questions: What does this mean to you? What led to this? What are the results? The first responsibility of the researcher is to create a process that will invite participants to produce the most data while minimizing the influence of the process on the content. The researcher's role then moves to facilitator, teaching the group members the process and guiding them to generate and analyze their own data with minimal external influence.

IQA research flow has four distinct phases: research design, focus group, interview, and report. Research design provides a series of tools to help articulate problems of interest, to identify constituencies that have an interest in the problem, and to state research questions that are implied by the problem statement. IQA then uses focus groups to identify the "map pieces" (affinities) of a system or systems that will ultimately represent the group's experience with the phenomenon. The group next identifies the "states," or the relationships between each of the affinities. Using a set of protocols or rules stemming from IQA systems theory, a system is drawn that represents a "mindmap" of the group's reality. Affinities defined by the group are then used to develop a protocol for interviews, which are invaluable in to further explore the meanings of the affinities and their systemic relationships. A comprehensive system diagram is developed from the interviews to explain the phenomenon. The final report allows the researcher to describe the affinities and their relationships, to make comparisons among systems and individuals, and to make inferences (predictions) based on the properties of the system(s). The following sections provide a summary of each stage in the research flow of a complete IQA study.

II. RESEARCH DESIGN

IQA research design starts with a problem or issue someone thinks is either interesting or needs attention. Often at this stage, a solution to some perceived problem is sought, but it is difficult to articulate what the problem really is. By its very nature, the problem is not clearly defined from the outset. IQA research flow presumes that this

ambiguity is a characteristic of the early thinking about a problem or issue and deals with the ambiguity by reduction during each recursive loop through the IQA design cycle. IQA research design starts with a vague problem or issue and seeks first to identify those who have something to say about the problem—the constituencies of that problem or issue. For each potential constituency, two questions are asked: How close is this participant to the problem, and how much power does this participant have over the phenomenon? The answers to these questions provide some indication as to the potential (or best suited) participants for the study based on their varying perspectives, their lived experience with the phenomenon, or their power over it.

Once a tentative issue has been defined for each constituency, research questions may be addressed. IQA systems theory offers a template for the design because any IQA study answers at most three "generic" research questions. The first two questions are: what are the components of the phenomenon, and how do the components relate to each other in a perceptual system? If more than one constituency is identified, a third systemic inquiry is possible: How do the systems between constituencies compare, both in terms of components, intra-systemic relationships, and inter-systemic relationships? If the answers to these two (or three) questions have relevance to the problem statement or overriding research question, the IQA methodology may provide a rich interpretive canvass upon which to generate and examine those answers.

III. FOCUS GROUPS – GROUP REALITIES

A. Focus Groups

IQA studies typically begin with a focus group—a group of people who share some common experience, work or live within some common structure, or have a similar background. This definition suggests that the researcher should think first about commonalities rather than differences when designing the composition of the group. IQA focus groups are formed with groups of individuals who may well have varied opinions and experiences with the system under study, but who more critically share a common perspective as part of the same constituency.

B. Identification of Factors/Affinities

The first step for an IQA focus group is silent brainstorming. During this phase a focus group is asked to write their experiences about the subject on note cards, one thought per card. After producing as many cards as possible, the focus group is asked to tape the cards along a wall. The researcher reads each card and the group comes to a consensus as to the meaning of the card, thus the foundations are laid for constructing, through discourse, a shared reality among group members. The facilitator then asks the group to silently organize the cards into groups of meaning, an activity referred to as *inductive coding*. Grouping is followed by the affinity naming and revision phase (*axial coding*), which consists of giving a name to the group and sorting any cards that may have been categorized into the "wrong" group.

IQA data collection/analysis techniques originated from Total Quality Management (TQM) processes designed to capture knowledge from organizational

members to solve problems and improve processes. A major TQM assumption is that people who are closest to the job best understand what is wrong and how to fix it. Similarly, IQA data collection techniques assist members of a group close to a phenomenon of interest in describing and labeling their experiences, and in articulating perceived relationships among these experiences to produce a theory in perception or a conceptual map, which is a systems representation of how a person or a group understands a particular phenomenon. This system consists of categories of meaning called *affinities* and the perceived causal relationships among the affinities which together comprise the mindmap of the group's lived reality concerning those affinities.

The first step in creating a mindmap is to assist the focus group members in organizing their thoughts into a manageable number of categories or affinities, sets of textual references that have an underlying common meaning or theme, synonymous to *factors* or *topics*. During affinity production, the constituents are given an opportunity to reflect upon their experiences and then express their thoughts and feelings. The thoughts of the group as a whole are combined and organized into common themes or affinities by the group itself with the aid of a facilitator. The group collectively names the affinities and helps the researcher create a detailed written description or definition of each affinity. The goal is to produce the smallest number of affinities with the greatest amount of detail or "richness."

Axial coding seeks to name, reorganize, clarify, and refine the affinities. While the first kind of coding is, as the name implies, almost exclusively inductive, axial coding cycles back and forth from inductive to deductive. Once the affinities are refined and often reorganized by the group participants, they are encouraged to narrow down the meanings of the affinities and their categories. Major categories of affinities are reviewed and then may be combined or divided into hierarchical systems of sub-affinities. This process is achieved through group discussion and consensus. The descriptions are refined and narrowed by the group until each participant agrees that the definition accurately reflects the meaning of the affinity. Affinities are given titles that accurately reflect the meaning of the affinity. Affinities are also given titles as determined by participants, which are documented on header note cards and placed at the top of each vertical column of cards. An example is provided below.

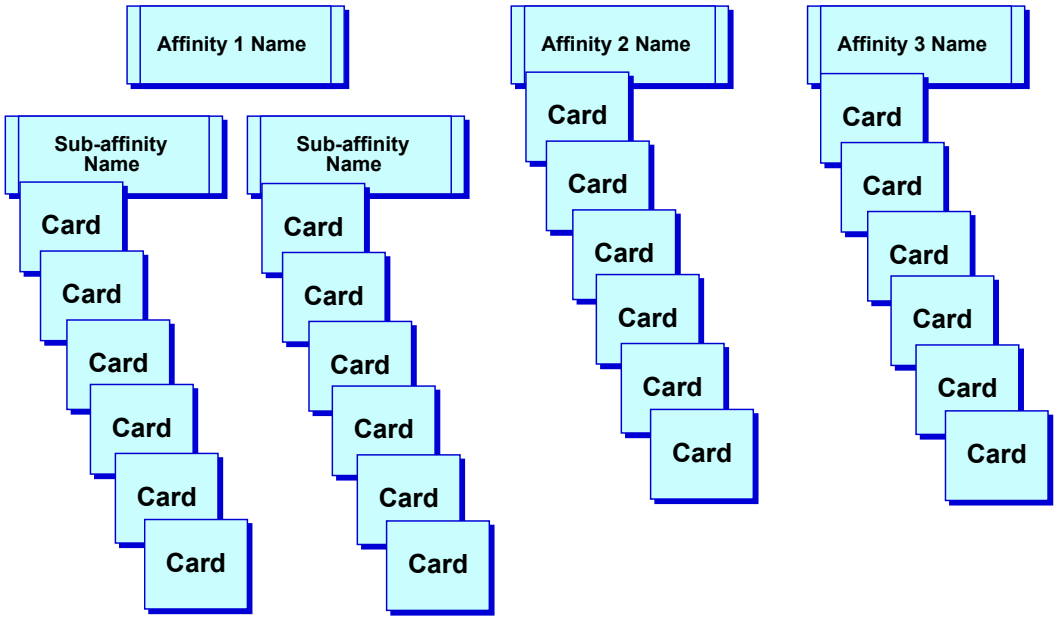


Figure A1. IQA Focus Group Card Sorting Exercise

C. Identification of Relationships Among Factors/Affinities

With the affinities clearly defined, the group is asked to analyze the nature of relationships between each of the affinities. They are given some rules: analyzing all possible pairs (only 3 possibilities; either A→B, or B→A, or no relationship). They are asked to record their responses in an *Affinity Relationship Table (ART),* which is a matrix containing all the perceived relationships in the system. IQA provides a variety of protocols for building the group *Interrelationship Diagram (IRD)*, which contains all the information required to produce the group (or individual) mindmap.

The purpose of IQA is to draw a picture of the system *(Systems Influence Diagram* or *SID)* that represents the perceptual terrain or the mindmap of a group with respect to a phenomenon represented by the issue statement. The SID is a picture drawn using a set of rules for rationalization on a summary of the theoretical codes called an *Interrelationship Diagram (IRD)* produced by the focus group. *Theoretical coding* refers to ascertaining the perceived cause and effect relationships (influences) among all the affinities in a system. In the focus group setting, this is accomplished by facilitating a systematic process of building hypothesis linking each possible pair of affinities. The group *Interrelationship Diagram (IRD)* summarizes the results of group theoretical coding.

All possible direct links between the affinities are investigated by developing hypotheses grounded in the data. IQA provides focus group participants with a formal protocol to determine whether or not there is a direct influence between every possible pair of affinities in the system. If so, the focus group then determines the directionality of influence. The goal is to identify the underlying structure of the group mindmap, which is summarized in a SID.

D. Constructing the Affinity Relationship Table

The preferred form of analyzing relationships among affinities is the "If…then…" or hypothetical construction. Hypotheses are recorded on a protocol called the *Affinity Relationship Table (ART)*. The *Simple ART* is the "quick and dirty" protocol for theoretical coding and is used only if time constraints are severe. Simple ARTs document the direction of relationship, but provide no detail by way of examples for the relationships. The following is an example of a Simple ART that represents, for illustrative purposes, a system of only six affinities and is a facsimile of the actual working form that would be used by a focus group doing theoretical coding on a 6-affinity system. Provided on all forms is a space reserved for the placement of affinity names. Since no affinity is more important than another, affinities are typically placed in alphabetical order. The affinity number does not represent any value placed on the affinity, but is simply a quick reference for each affinity.

Each focus group member is then asked to determine the nature of the relationship between all possible pairs of affinities. For any two affinities A and B, there are only three possible relationships: either A directly influences B, or B directly influences A, or there is no direct influence between A and B. These *Rules for Hypothesizing* are summarized as follows:

For any 2 affinities A and B, either
A $\rightarrow$ B (A influences B)
A $\leftarrow$ B (B influences A)
A <> B (No relationship)

If, for example, a member determines that affinity 2 influences affinity 1, a left arrow is placed between the pair on the Affinity Relationship Table. The member continues theoretical coding until the form is complete like the one illustrated below.

Affinity Name
1.
2.
3.
4.
5.
6.

Possible Relationships
A → B
A ← B
A <> B (No relationship)

Sample Affinity Relationship Table
Affinity Pair Relationship
1 ← 2
1 ← 3
1 → 4
1 ← 5
1 ← 6
2 → 3
2 ← 4
2 → 5
2 <> 6
3 <> 4
3 ← 5
3 <> 6
4 <> 5
4 ← 6
5 ← 6

Table A1. Sample IQA Affinity Relationship Table

E. Constructing the Interrelationship Diagram

The focus group then investigates links between the affinities by developing propositions (statements of cause and effect) from their own data. This activity, called theoretical coding, creates an extended reality for the group through further discourse. Again, IQA provides a number of protocols for this stage of analysis. Using a forced directional choice in a specific order, participants evaluate if there is a direct cause/effect relationship or if no relationship exists. The goal is to identify the skeleton of a "theory of common perception." Theoretical coding of the affinities results in an Interrelationship Diagram (IRD), a table that represents all the relationships among the affinities.

Creating an Interrelationship Diagram (IRD) is the first step in a general process called *rationalizing the system*. Output of the focus group hypothesizing activity is summarized in an IRD: a matrix containing all the perceived relationships in the system

between all perceived elements of the system. The IRD displays arrows that show whether each affinity in a pair is a perceived *cause* or an *effect*, or if there is *no relationship* between the affinities in the pair. The IRD is created by placing arrows into the table, thereby showing the direction of the relationships. An arrow pointing from A to B (A→B) indicates that A is the cause or influencing affinity and that B is the effect or influenced affinity.

The following example IRD represents a system of only six affinities. The blank IRD for a six-affinity system looks like this:

Tabular IRD									
	1	**2**	**3**	**4**	**5**	**6**	**OUT**	**IN**	**Δ**
1									
2									
3									
4									
5									
6									

Table A2. Sample IRD for 6-Affinity System

Arrows point only left or up, and each relationship is recorded twice in the IRD in a manner not unlike double entry bookkeeping. For example, if a relationship was determined between 1 and 2, it might be noted as 1 ← 2 and read as *2 influences 1*. Two arrows would be placed in the IRD to represent the relationship; the arrow in both cases points away from 2 and toward 1. All relationships are recorded in the table in this manner. Relationships from the ART are recorded in the table. Each relationship is recorded twice, once with an up arrow and once with a left arrow.

Tabular IRD									
	1	**2**	**3**	**4**	**5**	**6**	**OUT**	**IN**	**Δ**
1		←	←	↑	←	←			
2	↑		↑	←	↑				
3	↑	←			←				
4	←	↑				←			
5	↑	←	↑			←			
6	↑			↑	↑				

Table A3. Sample IRD: Intermediate Values for 6-Affinity System

The arrows are then counted to find the value of *delta*, thereby completing the table. The rules for calculating delta are:

Count the number of up arrows (↑) or *Outs*
Count the number of left arrows (←) or *Ins*
Subtract the number of *Ins* from the *Outs* to determine the (Δ) *deltas*
Δ = Out – In

Tabular IRD									
	1	**2**	**3**	**4**	**5**	**6**	**OUT**	**IN**	**Δ**
1		←	←	↑	←	←	1	4	-3
2	↑		↑	←	↑		3	1	3
3	↑	←			←		1	2	-1
4	←	↑				←	1	2	-2
5	↑	←	↑			←	2	2	0
6	↑			↑	↑		3	0	3

Table A4. Completed Sample IRD for 6-Affinity System

The table is then sorted in descending order of delta (see far right column) resulting the tabular affinity list provided below:

Tabular IRD – Sorted in Descending Order of Δ									
	1	**2**	**3**	**4**	**5**	**6**	**OUT**	**IN**	**Δ**
6	↑			↑	↑		3	0	3
2	↑		↑	←	↑		3	1	2
5	↑	←	↑			←	2	2	0
3	↑	←			←		1	2	-1
4	←	↑				←	1	2	-1
1		←	←	↑	←	←	1	4	-3

Table A5. Completed Sample IRD in Delta Order for 6-Affinity System

The value of delta is used as a marker for the relative position of an affinity within the system. Affinities with a positive delta are *relative drivers* or causes; those with negative deltas and *relative effects* or outcomes. The Tentative SID Assignments Table represents the initial placement of affinities for the SID.

An affinity marked by a high positive delta resulting from many *Outs* but no *Ins* is a *Primary Driver:* a significant cause that affects many other affinities but is not affected by others. Any affinity with no *Ins* is always a Primary Driver. The *Secondary Driver* is a relative cause or influence on affinities in the system. It is identified when there are both *Outs* and *Ins*, and there are more *Outs* than *Ins.* Quite often affinities have equal numbers of *Ins* and *Outs*, indicating a position in the middle of the system, suggesting the

metaphors of "circulator" or "pivot" in the final system representation. *Circulators/Pivots* occur when there are equal numbers of *Ins* and *Outs.* The *Secondary Outcome* reveals a *Relative Effect*. It is identified when there are both *Ins* and *Outs*, but more *Ins* than *Outs*. An affinity marked by a high negative number that results from many *Ins* but no *Outs* is a *Primary Outcome:* a significant affect that is caused by many of the affinities, but does not affect others. Any affinity with no *outs* is always a Primary Outcome. The tentative SID assignments based on the example data above would look like the figure below:

Tentative SID Assignments	
6	Primary Driver
2	Secondary Driver
5	Circulator / Pivot
3	Secondary Outcome
4	Secondary Outcome
1	Primary Outcome

Table A6. Tentative SID Assignments for Sample IRD

F. Constructing the System Influence Diagram

The System Influence Diagram (SID), also called a mindmap, is a visual representation of an entire system of influences and outcomes. The graphic representation of relationships paints a vivid picture of system dynamics for both investigator and participants, and lends itself readily to analyzing how modifications might change the nature of the system. Recursions or feedback loops are especially worthy of analysis. Feedback requires at least three affinities and has no beginning and no end. Previous affinities (those placed toward the *driver* zones) influence successive ones (those place toward the *outcome* zones), which in turn influence previous affinities. Although there is nothing in systems theory (or in the IQA application of systems theory) that demands that every system must exhibit recursion, the IQA protocols allow for the identification of recursion, unlike more traditional or quantitative path analytic approaches. As a visual representation of the mindmap developed from the data, the SID may be considered as a *set of qualitative structural equations* or as a *path diagram*; however, it is distinguished from traditional path diagrams in that recursion or feedback loops are allowed. The SID is a visual representation of the "theory of common perception," grounded in the specific experiences and logic of the participants.

In developing the SID, all of the affinities are arranged according to the Tentative SID Assignment chart, and is efficiently created with flow chart or outlining software program. The affinities are first placed on the screen in rough order of topological zones: Primary Drivers to the left of the screen, and the Primary Outcomes to the right. Secondary Drivers and Secondary Outcomes are then placed between the primaries. Each affinity number or name is placed in a shape (an oval, circle or square). Arrows draw the connections between each affinity in the direction of the relationship as represented in the IRD.

G. Cluttered and Uncluttered SIDs

The first version of the SID contains each link present in the IRD and is referred to as C*luttered*. The system is *saturated* with links containing all of the hypothesized relationships between affinities as identified by participants in the protocol leading to the IRD. The problem with saturation is that a cluttered SID, while being comprehensive and rich, can be very difficult to interpret even for a modest number of affinities that are highly interlocked or embedded within the system. Indeed, many systems have so many links that the explanatory power of the system becomes bogged down in the details of the relationships. Comprehensiveness and richness are objectives of the SID; however, parsimony is an objective as well. To reconcile the richness–parsimony dialectic, a supplementary or secondary SID called the U*ncluttered* SID is produced having redundant links removed. The following graphic demonstrates the concept of a redundant link in its simplest manifestation:

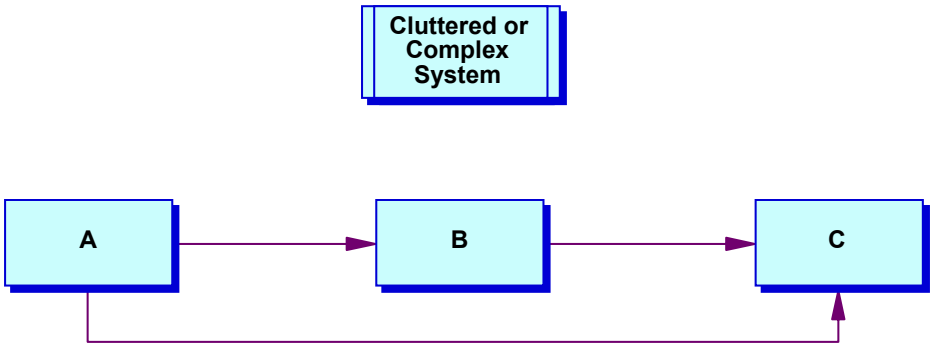


Figure A2. Sample Cluttered System

The system above represents the perception of an individual or a group as follows: A influences B; B influences C; and A influences C. We can both simplify the model and provide one answer (note: not necessarily the answer) to the question, "*How does A influence C?"* by eliminating the redundant link.

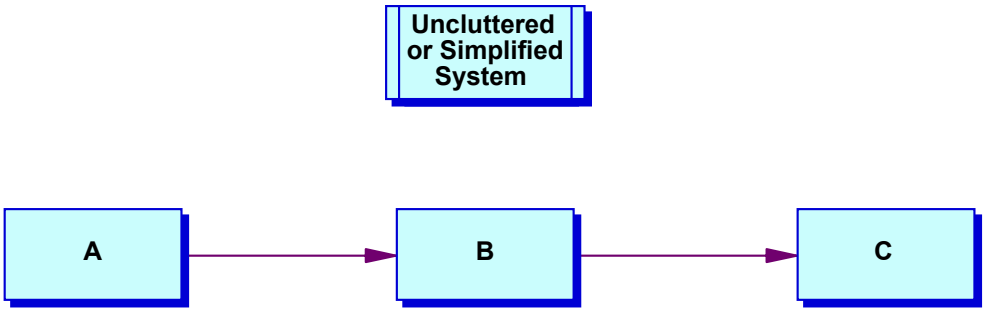


Figure A3. Sample Uncluttered System

The link from A to C as been removed because it is redundant; not in the sense that A does not influence C in some meaningful, and possibly even direct manner (it might), but in the sense that one way in which A influences C is through the mediation of B. In other words, one way to explain how A influences C is by pointing to B. It may be true in some absolute universe that A directly influences C; even so, without B how do we explain the influence? Thus, by eliminating links that skip over mediating affinities, we achieve both a simpler, more interpretable mental model—one that has optimum explanatory power.

This is not to say that cluttered mental models are not useful; nor is it to say that either the cluttered or the uncluttered version is right while the other is wrong. However, the IQA methodology relies most heavily on the uncluttered version for interpretation, analysis, and forecasting. Oftentimes, the only statement one can make of some highly saturated or cluttered SIDs is that everything is linked to everything else in the participants' minds. This statement, while no doubt true, is ultimately of limited use for many theoretical and practical applications.

In creating the pictorial representation of the SID, the affinities are laid out horizontally in rough topological zones based on their tentative SID order. In zones that contain more than one affinity, the affinities are placed vertically in descending order of delta as pictured below:

Tentative SID Assignments	
6	Primary Driver
2	Secondary Driver
5	Circulator / Pivot
3	Secondary Outcome
4	Secondary Outcome
1	Primary Outcome

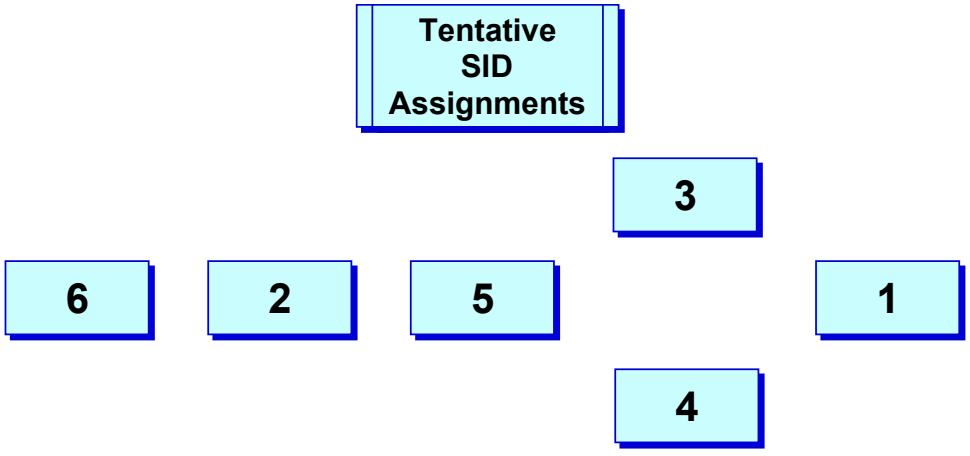


Figure A4. Sample Tentative SID Assignments in Tabular and Graphical Form

Arrows are then drawn according to the Affinity Relationship table to represent the relationships between the affinities. A SID with all links drawn is known as the *Cluttered* SID.

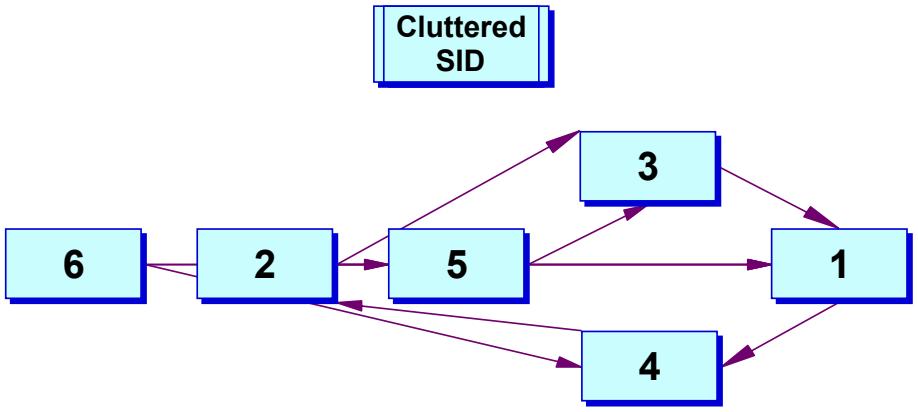


Figure A5. Sample Cluttered SID: Flat

Too often relationships are difficult to identify when the SID is laid out flat in topological zones. By spreading the SID into a circle, relationships can be more easily identified. Arranging the arrows so that they have a common output or input point also makes the SID easier to read. When systems grow to have 10 or more affinities, the necessity for this step is even more apparent. The Cluttered SID for the example data is complete at this point:

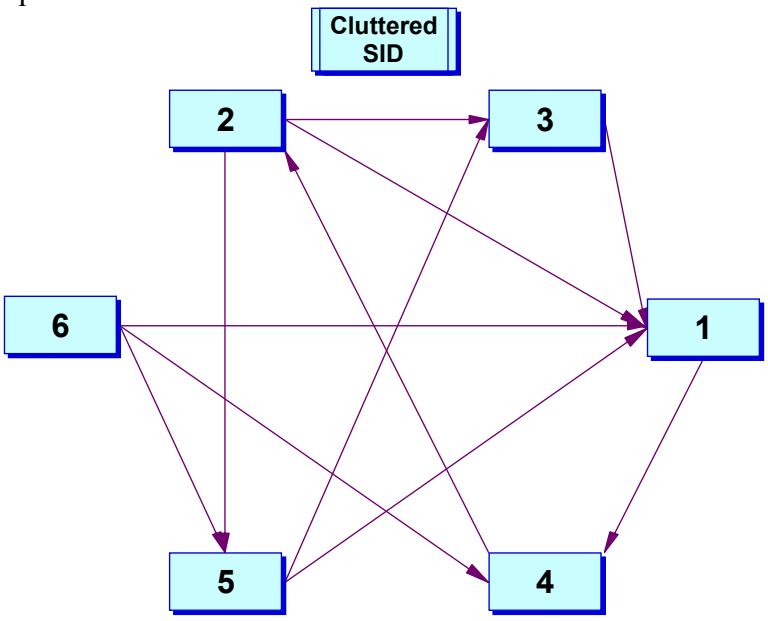
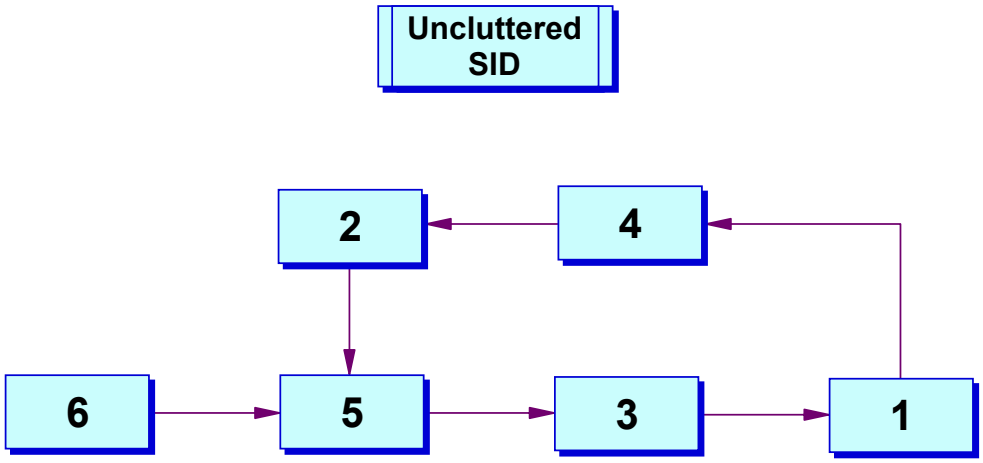


Figure A6. Sample Cluttered SID: Expanded

The Cluttered SID is also developed and spread out in a circular fashion in order to make it easier to identify and remove redundant links. Redundant links are links between two affinities and, even if removed, a path from the driver to the outcome can be achieved through an intermediary affinity.

Redundant links are removed according to their delta and SID assignments, comparing affinities at the extreme left and the extreme right, then working back to the left. The relationship between the highest positive delta and the highest negative delta is examined. If there is any path between the two deltas other than the direct link, that link can be removed. Next, the relationship between the highest positive delta and the next highest negative delta is examined. If there is any path between the two deltas other than the direct link, that link can be removed.

The *Uncluttered* SID is the simplest possible representation consistent with all the relationships contained in the IRD. The IRD from which the Uncluttered SID above was derived is reproduced below to make it more convenient to verify this claim



Tabular IRD – Sorted in Descending Order of Δ

	1	2	3	4	5	6	OUT	IN	Δ
6	↑			↑	↑		3	0	3
2	↑		↑	←	↑		3	1	2
5	↑	←	↑			←	2	2	0
3	↑	←			←		1	2	-1
4	←	↑				←	1	2	-1
1		←	←	↑	←	←	1	4	-3

Figure A7. Sample Uncluttered SID: Verification of IRD Data

Drawn from the previous example IRD, it was indicated that affinity 6 influences affinities 1, 4, and 5. Examination of the Uncluttered SID reveals that 6 ***does*** influence 1 (mediated by 5 and 3); 6 influences 4 through the mediation of 5, 3, and 1; and 6

influences 5 directly. Each of the relationships in the IRD is represented in the Uncluttered SID in the sense that each of the arrows in the IRD is a route from a point of origin (cause) to a destination (effect). Here, then, is the central theorem of IQA representation*: given any set of affinities and a set of binary unidirectional relationships among these affinities, there exists one, and only one, Uncluttered SID*. The following are some implications of this theory. First, every system has a unique, simplest representation, topologically speaking. Two different analysts working from the same protocol on the same IRD will produce the same Uncluttered SID (although they have a different appearance, they will be topologically identical). Second, as stated above, the process of constructing the system (rationalizing the system via IRD and SID) is ***not*** dependent on the "meaning" or "content" of the affinities. The focus group's or the analyst's understanding, or opinions about, or emotional involvement with, the affinities (what each affinity stands for) have nothing to do with the way in which the Uncluttered SID is constructed. As far as the process of rationalization is concerned, the affinities and the relationships among them are simply abstract concepts that are assembled into a structure according to a set of rules.

H. Clean SIDs

The final version, the *Clean* SID, shows the Uncluttered SID (the mindmap containing only the minimum number of links required to completely represent the underlying logic of the IRD) in bold, with the redundant links in a diminished color. Interpretation of the final SID depends primarily upon the Uncluttered SID (because it is the simplest, yet paradoxically has the most explanatory power); however, re-insertion of the redundant links produces a representation that captures the mindmap of the participants in both its original (or un-rationalized) form and its rationalized form. As an example, in the mindmap below, the participants reported a link between affinities 6 and 4. This link was not part of the uncluttered path, but that does not mean there is no "direct" link in the participants' minds; there very well may be. The important question is, "What could explain the perception that affinity 6 influences affinity 4?" One can look at the uncluttered path on the final SID and see immediately that the logic is a follows: 6 influences 5, which influences 3, which in turn influences 1, which finally influences 4. Thus, the Uncluttered SID elaborates the simple 6-4 relationship as 6-5-3-1-4. In order to describe how 6 and 4 are related in the perception of the participant, the researcher can point to the chain of influences among these affinities.

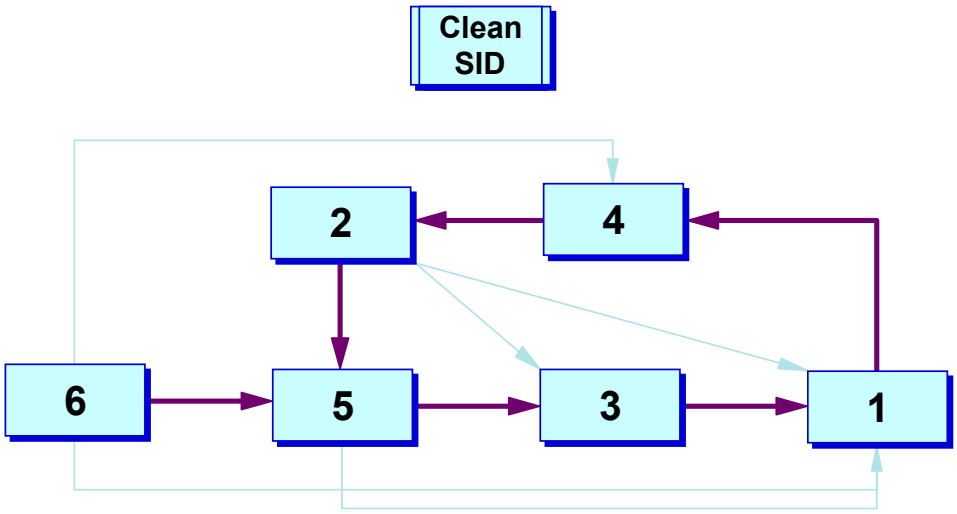


Figure A8. Sample Clean SID

How might one reconcile the question as to whether 6 influences 4 directly on the one hand, or indirectly on the other? According to the IQA methodology, this is actually a false dilemma that results from the dialectical nature of reality and language (Northcutt & McCoy, 2004). Indeed, it surely is correct to say that a slamming door makes a noise. It is also correct to say that the collision of the door with the doorjamb creates a disturbance in the air at the point of contact that travels in a waveform outward from the door. When this wave strikes the eardrum of the listener, mechanical energy is transformed to electrical impulses that travel to the brain, which interprets the signals as a loud noise. Both explanations are correct, although the first explanation describes the relationship between the door slamming and the noise as a "direct" one; the second describes a series of "intervening" affinities. The issue, therefore, is not the correctness of one description over the other, but is one of the desired details of representation.

The steps described above represent a complete journey through the second phase of the IQA methodology; however, a simple Uncluttered SID is all that is needed if one plans to conduct follow-up interviews. The use of the Simple ART is the fastest method for the creation of the SID because all that is needed is a general idea of what the relationships between affinities are without dedicating a great deal of time to the process. After the focus group has had time to think about and record their codes (in groups or as individuals) a simple majority vote is taken. The results are recorded in an ART by the researcher. The majority vote decides the direction of relationship. With this, the researcher is ready to create an IRD and a SID in the manner described above. If a more rigorous SID is required, individual ARTs could be considered. These ARTs are collected by the researcher and a Pareto Composite is developed (the Pareto Protocol will be discussed in greater detail in the next section).

IV. INTERVIEWS – INDIVIDUAL REALITY/REALITIES

The IQA interview is a semi-structured interview. It is designed to capitalize on the consistency afforded by highly structured interview and the level of detail offered by open-ended or emergent interviews. The interview questions are designed and based on the affinities and sub-affinities developed by the focus group members. An IQA interview protocol is designed to achieve specific objectives, each of which relate directly to the research questions of the study. In particular, IQA interviews serve to add richness and depth description of the meaning of affinities that is not possible with a focus group alone, and allow for individual mindmaps, which can be used in a debriefing session as an interpretive aid to the investigator.

The affinities produced by the focus group are used to create an interview protocol for the second round of data gathering: the interview. The individual interviews based on that protocol are then used to confirm the affinities created by the focus group and to elicit descriptions of relationships among the affinities. Thus, the focus group serves as a resource for guiding the subsequent interview structure; but it also serves as a pilot study to guide further research by providing a tentative (albeit limited) snapshot of the group mindmap.

Structuring the interviews using the focus-group derived protocol allows the researcher to ensure that each affinity is explored thoroughly and consistently. Following the protocol also frees the researcher to focus attention on eliciting and responding to each interviewee's distinct responses while still limiting the domain of inquiry to a central set of core concerns. The interview process enables the researcher to achieve several goals: to provide data representing the respondent's personal mindmap; to help the researcher code the impact and influences of these affinities in order to create a systems influence diagram; and to provide data representing the group's collective mindmap.

The creation of an IQA interview protocol is straightforward. The protocol consists of two parts: one, the open-end *axial interview* designed to provide rich description of affinities by the respondents; and two, the structured *theoretical interview* designed to identify relationships between affinities. The axial interview section is derived from the affinity write-up, while the theoretical interview is presented through an affinity relationship table.

The affinity write-up is the basis of the open-ended questions of the axial interview. The interviewer need only address the affinity names themselves. The write-up provides the interviewer with a quick reference as to the agreed-upon meaning of the affinity defined by the focus group. The interviewer seeks to address, "What does the affinity mean to you? Tell me about your experience with the affinity."

The Affinity Relationship Table (ART) is the basis for the theoretical interview. The table provides a quick reference of all of the possible relationships between affinities. Presented with a copy of the table, the respondents are asked if they believe there is a relationship between each affinity and to explain why they believe so. They are probed to provide concrete exemplars of their experiences with the relationship.

Analysis of an IQA interview proceeds parallel to the manner focus group protocol. For each of the affinities, the interview respondent is asked three kinds of questions: What does this mean to you? What led to this? What are the results? In a

manner analogous to the focus group's activities, the interview transcript is coded both axially and theoretically as follows.

A. Individual Interview Axial Code Table (ACT)

The ACT is the primary documentation for all utterances that illustrate the range of meaning of each affinity for each respondent. The researcher identifies axial codes by noting key words or phrases that describe or illustrate an affinity. This text is then documented for easy retrieval in a form known as the *Individual Interview Axial Code Table.* Quotes relating to a specific affinity can be cut and pasted into the ACT, along with the line(s) of the transcript that were the source of the axial quote. There will usually be multiple axial quotes for any given affinity; each quote represented by another row in the ACT.

Coding an interview is the first step toward creating a mindmap. Once the transcript has been prepared, the researcher analyzes the text for *axial codes*, which are *specific examples of discourse that illustrate or allude to an affinity*. The structure of the interview was designed to make this step relatively straightforward. The meaning of each affinity is explored with each respondent according to a standard (but flexible) protocol and his or her descriptions are transcribed line-by-line. The researcher reviews each line of the interview transcript and looks for phrases or statements that define and provide examples of a specific affinity. These examples may be symbolic or metaphorical statements concerning the affinity, clearly stated descriptions of how the affinity becomes manifest in the experience of the respondent, or proximal descriptions of other affinities in the context of the one being addressed. Respondents will often describe how one affinity relates to another in the process of discussing the nature of one affinity. The researcher does not discourage such descriptions at this time as such relationships will be formally coded in the second phase of the interview. A sample individual Interview Axial Code Table appears below:

Sample Individual Interview Axial Code Table			
Affinity	**Transcript Line**	**Axial Quotation**	**Researcher Notes**
1.			
2.			
3.			
4.			
5.			

Table A7. Sample Axial Code Table

B. Individual Interview Theoretical Code (TCT) Affinity Relationship Table

The TCT is the primary documentation for all utterances that illustrate the manner in which the affinities are related for each respondent. The researcher also identifies, through a formal line of questioning in the second phase of the IQA interview: *theoretical codes*, which *illustrate a relationship between two or more affinities*. The relationship reported by the respondent (using the same rules as the focus group) is recorded by placing the appropriate arrow in the *Individual Interview Theoretical Code Affinity Relationship Table*, which documents both the direction of the relationship and the example or line of reasoning given by the respondent. Additionally, the interview transcript should is examined for statements that illustrate a link between affinities. Additional relational quotations (offered without prompting) may be found in the axial interview and are also placed in the table. The transcript lines for each utterance are also recorded in the table using a format like the one shown below:

Sample Individual Interview Theoretical Code Affinity Relationship Table			
Affinity Pair Relationship	**Line Number**	**Theoretical Quotation**	**Researcher Notes**
1 ← 2			
1 ← 3			
1 ← 4			

Table A8. Sample Theoretical Code Table

C. IQA Combined Interviews

Once all interviews have been coded, the data from the interviews are summarized to create a combined SID that represents a composite of the individuals' experience with the phenomenon. Axial data are transferred from each *Individual Interview Axial Code Table* to a *Combined Interview Axial Code Table*. By combining all interviews into one table, the researcher creates a database for the entire set of respondents containing all axial codes for all affinities, with each code containing a link or a reference to the transcript and line numbers that produced the code. This table is very similar to the one used to record axial codes for an individual interview except that it also contains a link to the transcript that produced the code as well as the line number:

Sample Combined Interview Axial Code Table			
Affinity	**Transcript Line**	**Axial Quotation**	**Researcher Notes**
1.			
2.			
3.			
4.			
5.			
6.			

Table A9. Sample Combined Axial Code Table

The procedure outlined above is also used for combining theoretical data into the *Combined Interview Theoretical Code Affinity Relationship Table*. Because individual respondents may have defined relationships differently and may, in fact, disagree about the direction of a relationship, this table lists both directions for each relationship as pictured here:

Sample Combined Interview Theoretical Code Affinity Relationship Table			
Affinity Relationship	**Transcript & Line #**	**Theoretical Quotation**	**Researcher Notes**
1 → 2			
1 ← 2			
1 → 3			
1 ← 3			

Table A10. Sample Combined Theoretical Code Table

D. Theoretical Code Frequency Table

A model approach is used to prepare an Interrelationship Diagram (IRD) for the combined interview group. The *Combined Interview Theoretical Code Frequency Table* is analogous to an *Affinity Relationship Table (ART)* used for focus groups. Much like the vote that occurs when the focus group is asked to identify relationships, the *frequency* of relationships as reported by all interviewees determines the direction as illustrated in this chart:

Affinity Pair Relationship	Frequency		Affinity Pair Relationship	Frequency
$1 \rightarrow 2$	3		$1 \rightarrow 5$	1
$1 \leftarrow 2$	0		$1 \leftarrow 5$	1
$1 \rightarrow 3$	1		$1 \rightarrow 6$	2
$1 \leftarrow 3$	0		$1 \leftarrow 6$	1
$1 \rightarrow 4$	0		$2 \rightarrow 3$	3
$1 \leftarrow 4$	18		$2 \leftarrow 3$	17

Table A11. Sample Combined Theoretical Code Frequency Table

E. Composite SID and the Pareto Protocol

Once all interviews have been coded, the data from the interviews are summarized to create a combined SID that represents a composite of the individuals' experience with the phenomenon. First, a count of each theoretical code is entered into the Combined Interview Theoretical Code Frequency Table. Because individual respondents may have defined relationships differently, and may disagree about the direction, IQA provides a protocol (Pareto Protocol with Min/Max Criterion) to construct a composite SID from individual interview SIDs.

Selecting a protocol for representing the consensus or the preponderance of the group's analysis of relationships is similarly independent of level of detail or group organization. A reasonably rigorous and powerful technique for achieving and documenting the degree of consensus in a focus group is the Pareto Principle, named after the 19th century economist Wilfredo Pareto (1843-1913). Pareto wrote of the "trivial many and the significant few" in his analysis of productivity and economics. The principle has been used in quality management to help focus priorities by providing an easy-to-remember rule of thumb. Put in systems terms, the Pareto Principle states that in general, *20% of the variables in a system will account for 80% of the total variation in outcomes* (such as productivity or profit). The essential utility of the Pareto Principle is this: a minority of the relationships in any system will account for a majority of the variation within the system. Depending upon the variation of theoretical coding used, it is quite likely that there will be some disagreement among either individuals or subgroups about the nature of a given relationship. IQA uses the Pareto rule of thumb operationally to achieve consensus and analytically to create a statistical group composite. The *Pareto Cumulative Frequency Chart* provides an efficient method for achieving consensus.

Continuing the six-affinity example discussed previously, assume that each interviewee has completed an individual ART. The first step in calculating frequencies is to record the total number of votes for each relationship pair in affinity order as show below:

Affinity Pair Relationship	Frequency	Affinity Pair Relationship	Frequency
$1 \rightarrow 2$	3	$2 \leftarrow 5$	3
$1 \leftarrow 2$	0	$2 \rightarrow 6$	3
$1 \rightarrow 3$	1	$2 \leftarrow 6$	0
$1 \leftarrow 3$	0	$3 \rightarrow 4$	1
$1 \rightarrow 4$	0	$3 \leftarrow 4$	0
$1 \leftarrow 4$	18	$3 \rightarrow 5$	0
$1 \rightarrow 5$	1	$3 \leftarrow 5$	18
$1 \leftarrow 5$	1	$3 \rightarrow 6$	1
$1 \rightarrow 6$	2	$3 \leftarrow 6$	1
$1 \leftarrow 6$	1	$4 \rightarrow 5$	2
$2 \rightarrow 3$	3	$4 \leftarrow 5$	1
$2 \leftarrow 3$	17	$4 \rightarrow 6$	3
$2 \rightarrow 4$	2	$4 \leftarrow 6$	17
$2 \leftarrow 4$	15	$5 \rightarrow 6$	2
$2 \rightarrow 5$	13	$5 \leftarrow 6$	15
		Total Freq.	**185**

Table A12. Sample Combined Theoretical Code Frequency Table for 6-Affinity System

A total of 185 votes were cast for a total of 30 (30 permutations of 6 items taken pair wise) possible relationships. Some relationships received no votes at all; all interviewees voted for others; and some relationships attracted a split vote. The next step is to sort the relationships in descending order of frequency and calculate cumulative frequencies and percentages in terms of both the total number of relationships (30), as well as the total number of votes (185, which is a proxy for the total variation in the system).

Affinity Pair Relationship	Frequency Sorted (Descending)	Cumulative Frequency	Cumulative Percent (Relation)	Cumulative Percent (Frequency)	Power
1. $2 \rightarrow 3$	20	20	3.3	10.8	7.5
2. $1 \leftarrow 2$	18	38	6.7	20.5	13.9
3. $3 \leftarrow 5$	18	56	10.0	30.3	20.3
4. $4 \leftarrow 6$	17	73	13.3	39.5	26.1

5. $2 \leftarrow 4$	16	89	16.7	48.1	31.4
6. $1 \leftarrow 3$	15	104	20.0	56.2	36.2
7. $5 \leftarrow 6$	15	119	23.3	64.3	41.0
8. $2 \rightarrow 5$	13	132	26.7	71.4	44.7
9. $1 \leftarrow 6$	12	144	30.0	77.8	47.8
10. $1 \leftarrow 5$	11	155	33.3	83.8	50.5
11. $1 \rightarrow 3$	3	158	36.7	85.4	48.7
12. $1 \rightarrow 4$	3	161	40.0	87.0	47.0
13. $2 \rightarrow 4$	3	164	43.3	88.6	45.3
14. $2 \rightarrow 6$	3	167	46.7	90.3	43.6
15. $4 \rightarrow 6$	3	170	50.0	91.9	41.9
16. $2 \leftarrow 5$	3	173	53.3	93.5	40.2
17. $5 \rightarrow 6$	2	175	56.7	94.6	37.9
18. $4 \rightarrow 5$	2	177	60.0	95.7	35.7
19. $1 \rightarrow 2$	1	178	63.3	96.2	32.9
20. $1 \leftarrow 4$	1	179	66.7	96.8	30.1
21. $1 \rightarrow 5$	1	180	70.0	97.3	27.3
22. $3 \rightarrow 4$	1	181	73.3	97.8	24.5
23. $3 \rightarrow 6$	1	182	76.7	98.4	21.7
24. $3 \leftarrow 6$	1	183	80.0	98.9	18.9
25. $4 \leftarrow 5$	1	184	83.3	99.5	16.1
26. $1 \rightarrow 6$	1	185	86.7	100.0	13.3
27. $2 \leftarrow 3$	0	185	90.0	100.0	10.0
28. $2 \leftarrow 6$	0	185	93.3	100.0	6.7
29. $3 \leftarrow 4$	0	185	96.7	100.0	3.3
30. $3 \rightarrow 5$	0	185	100.0	100.0	0.0
Total Frequency	**185**				

Table A13. Sample Pareto Protocol and Power Analysis Table

The table above contains the same frequencies as the first, but has been sorted in descending order of frequency. Four columns have been added as follows. First is *Cumulative Frequency*. Entries in this column contain the running total or cumulative frequency. Each entry is the frequency of votes cast for an affinity pair added to the previous total. Second, *Cumulative Percent (Relation)*, is a cumulative percent based upon the number of total possible relationships, in this case 30; i.e., each relationship

represents 1/30 or approximately 3.3% of the total possible number. This cumulative percentage is one of two factors in the Power index. Third, *Cumulative Percent (Frequency)*, is a cumulative percent based upon the number of votes cast (185). Each entry is the percent of votes cast for an affinity pair added to the previous total. Finally, *Power*, is an index of the degree of optimization of the system and is simply the difference between Cumulative Percent (Frequency) and Cumulative Percent (Relation)

The last two columns of the Pareto table are the keys to deciding which relationships should be included in the composite *Interrelationship Diagram (IRD)*. Since the relationships are displayed in decreasing order of frequency, the question is one of where to set a cutoff point—how to decide which relationships to exclude from the group IRD. Relationships such as the ones numbered 27 thru 30 in the above table should clearly be excluded as they attracted no votes at all. But how should a cutoff point be determined for affinities that attract relatively few votes? The decision involves optimizing a tradeoff between two criteria: the composite IRD should account for maximum variation in the system (cumulative percent based upon frequency) while minimizing the number of relationships in the interest of parsimony (cumulative percent based upon relations). The resulting affinities and relationships are incorporated into a composite SID using the same methodology described in the focus group section above.

F. Theoretical Sidebar: Ambiguous Relationships.

Before returning to the practicalities of theoretical coding, it is useful to develop the theory of theoretical coding in the light of what can be called "ambiguous" relationships, especially considering their importance to the identification of feedback loops. For instance, assume that the interviewees have written a number of hypotheses arguing that affinity A influences affinity B (A→B). Another set of hypotheses argues the opposite, that B→A. When submitted to the Pareto Chart, the argument is not resolved: the top 20% contain hypotheses that argue for both directions, and both sets seem equally plausible.

The key lies in the realization that this kind of argument is most likely the result of failure to identify at least one other affinity that somehow intervenes between, or interacts with, both A and B. Consider the topologies of the simplest system that can produce this ambiguity—one involving only three affinities A, B (the ones that are involved in the ambiguity) and a third, affinity C. Only two topologies are consistent with the ambiguity, as illustrated by the following:

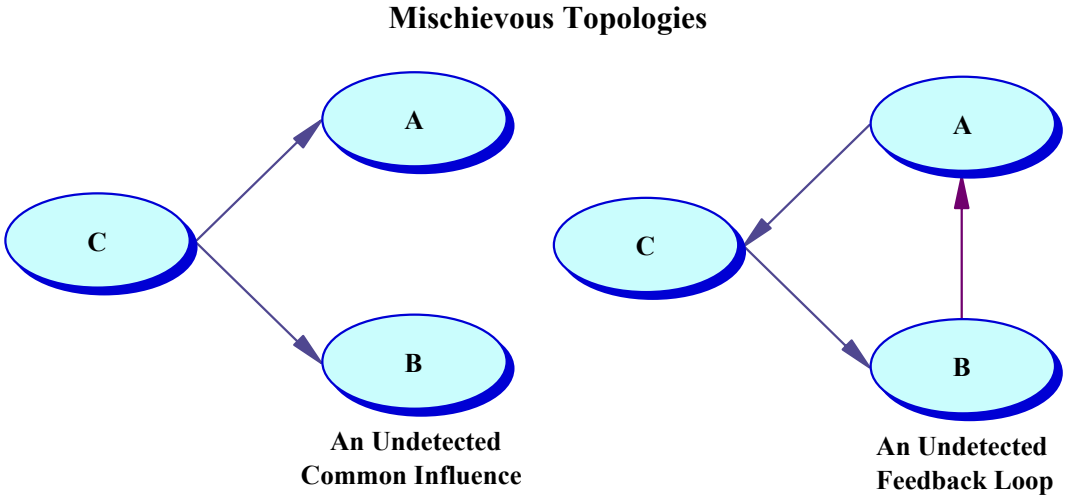


Figure A9. Mischievous System Topologies

1. The Undetected Common Influence.

If both affinities A and B are the result of a common affinity C, they will co-vary in some meaningful way. This configuration (topology on left) is one plausible explanation for the argument about the direction of the arrow between A and B. Since the interviewees, at least at this point in the process, are not aware of the common influence of C on both A and B, it is not surprising that there will be ambiguity during the individual interview phase of the project about the relationship between A and B.

2. The Undetected Feedback Loop.

Suppose that A, B, and C are related to each other as indicated by the topology on the right. This is the picture of the simplest kind of feedback loop in which each affinity has an influence on the other two in the system. At first glance, one might conclude that the feedback loop topology supports those who argue B $\rightarrow$ A since the arrow emerges from B and terminates at A. However, A influences C, which in turn influences B, so A influences B indirectly; therefore, if C is excluded from the argument, we are likely to find equally compelling hypothesis supporting both directions A $\rightarrow$ B and B $\rightarrow$ A.

3. Exploiting Ambiguous Relationships.

When there are compelling hypothesis pointing in both directions, IQA systems theory suggests there are only two conditions that reasonably account for the ambiguity. This is not to say that all ambiguous relationships are simple three-affinity systems. Many more than three may be involved. Nevertheless, one can exploit the knowledge that the ambiguity is probably produced by either some common affinity in a subsystem

involving at least three affinities, or by the linking of the two affinities in question in a feedback loop involving, again, at least three affinities.

This is accomplished by modifying the rule for hypothesizing by coding the ambiguous relationship with the highest frequency with the appropriate arrow and coding the relationship with the smaller frequency with a question mark (?). In short, these ambiguous relationships are put into "suspense" until a picture of the system (the SID) is created based upon the other unambiguous relationships. If examination of the SID reveals that the ambiguous relationship is part of a subsystem that is one of the two mischievous kinds described above, then the SID accounts for the ambiguity and nothing else need be done. On the other hand, if the two affinities in question are not related either through a common affinity and are not part of a feedback loop, then the researcher must either re-analyze and re-hypothesize with respect to at least some of the affinities, or the researcher must admit that the relationship is still ambiguous and a special effort must be made to resolve the ambiguity using interview and focus group data. An example of this process in action is provided in the sample relationship conflict summary table below:

Affinity Pair Relationship	Frequency	Use
$2 \leftarrow 8$	10	Use
$2 \rightarrow 8$	7	
$3 \leftarrow 10$	9	
$3 \rightarrow 10$	13	Use
$4 \leftarrow 6$	9	
$4 \rightarrow 6$	14	Use
$4 \leftarrow 10$	8	Use
$4 \rightarrow 10$	7	
$6 \leftarrow 10$	17	Use
$6 \rightarrow 10$	7	
$8 \leftarrow 9$	7	
$8 \rightarrow 9$	13	Use

Table A14. Sample Relationship Conflict Summary

V. RESULTS AND INTERPRETATION

The IQA systems approach is designed to be of the greatest possible assistance in interpretation. The focus group is used to identify the affinities, each of which is well documented as part of the focus group protocol. Interviews then expand on the descriptions of the affinities and the relationships between them. The primary vehicle for representing these experiences, perceptions, and interpretations is the IQA report. A

typical IQA report accomplishes three goals: naming and describing the elements of the system; explaining relationships among elements of a system (system dynamics); and comparing systems.

In order to set a base for systems analysis, each affinity is identified and discussed in detail. Included in such a discussion are succinct and relevant quotes from the interviews that help illustrate the range of meaning for each affinity. Affinities comprising the system are described largely in the participants' own words. The SID is then presented and readers are given a tour through the system in which the relative influence of each affinity on others is described in a systemic context; once again, the words of participants are used to illustrate the behavior of the systemic links, to "ground" the abstract representation that is the SID in the data of the participants' words and descriptions.

Finally, comparisons can be made at two levels. First, a qualitative analogue to the statistical concept of variation is possible by comparing individual mindmaps to each other and to the composite. Second, a qualitative analogue to post hoc group comparisons is possible by comparing the composite mindmaps of different constituencies. These two interpretive protocols are the logical results of the dialectical nature of IQA research based on the following fundamental assumptions:

1. Individuals are unique in meaningful ways. Individual perspectives or voices are important and should not get lost in our attempt to find patterns. However …
2. Patterns or commonalities in perceptions do exist within constituencies. These patterns or abstractions are useful for both theoretical and practical purposes. Furthermore…
3. Comparison is the primary method of interpretation, both from the participant's point of view and from the investigator's. IQA focus group and interview protocols are designed to encourage constant comparison by the participants. For the investigator, comparisons may be made among individuals within and across constituencies (comparing individual mindmaps to each other and to composites), or comparisons among constituencies (comparing composites).

A final outcome of the IQA reporting process is not necessarily built into the protocols of the methodology itself, but can be utilized at the researcher's discretion if the need or want arises. Specifically, once a system of affinities and relationships is formulated and described, it essentially becomes a "theory of lived experience" and can be "exercised" and tested much as any other theory might be. For example, one might use the resultant system (SID) to "predict," based on its internal logic, the ultimate state of the outcome affinities given known states of its antecedent affinities. One could also ask what antecedents might, by the logic of the system, lead to a particular state of its outcomes. Finally, one might ask what might be the effect of extra-systemic influences or those forces not named or accounted for in the system.

During each phase of IQA methodology, each of the elements in the IQA research flow is represented by a protocol. Each of these protocols is further supported by a document or set of documents resulting in a public data collection and analysis audit trail for the entire study. Issues of credibility and trustworthiness are addressed, at least in

part, by a standard analytical protocol that is not dependent on the subject matter (the nature of the affinities) or the inclinations of the researcher, but by the standardization and documentation of each step in the research process.

Appendix B: Phase 1 and 3 Pareto Protocols and System Influence Diagram Assignments

Affinity Pair Relationship	Frequency Sorted (Descending)	Cumulative Frequency	Cumulative Percent (Relation)	Cumulative Percent (Frequency)	Power
1 > 3	43	43	0.9	1.9	1.0
3 < 6	41	84	1.8	3.8	2.0
3 < 7	41	125	2.7	5.6	2.9
3 < 11	40	165	3.6	7.4	3.8
5 > 10	40	205	4.5	9.3	4.7
3 < 5	38	243	5.5	11.0	5.5
4 > 11	38	281	6.4	12.7	6.3
3 < 9	38	319	7.3	14.4	7.1
6 > 11	38	357	8.2	16.1	7.9
8 > 9	38	395	9.1	17.8	8.7
3 < 10	37	432	10.0	19.5	9.5
1 > 9	37	469	10.9	21.2	10.3
5 > 11	36	505	11.8	22.8	11.0
4 > 9	36	541	12.7	24.4	11.7
2 > 3	35	576	13.6	26.0	12.4
8 > 11	35	611	14.5	27.6	13.0
1 > 11	35	646	15.5	29.2	13.7
3 < 8	35	681	16.4	30.7	14.4
4 > 10	35	716	17.3	32.3	15.1
4 > 5	34	750	18.2	33.9	15.7
3 < 4	34	784	19.1	35.4	16.3
6 > 10	34	818	20.0	36.9	16.9
5 > 9	34	852	20.9	38.5	17.6
2 > 10	33	885	21.8	40.0	18.1
8 > 10	33	918	22.7	41.4	18.7
2 > 9	32	950	23.6	42.9	19.3
7 > 9	32	982	24.5	44.3	19.8

1 > 10	31	1013	25.5	45.7	20.3
6 > 9	31	1044	26.4	47.1	20.8
1 > 7	30	1074	27.3	48.5	21.2
9 < 11	30	1104	28.2	49.8	21.7
2 < 6	30	1134	29.1	51.2	22.1
4 > 7	28	1162	30.0	52.5	22.5
5 > 7	28	1190	30.9	53.7	22.8
7 > 11	28	1218	31.8	55.0	23.2
10 < 11	27	1245	32.7	56.2	23.5
2 < 4	27	1272	33.6	57.4	23.8
2 > 11	26	1298	34.5	58.6	24.1
4 > 8	26	1324	35.5	59.8	24.3
1 < 8	25	1349	36.4	60.9	24.5
1 < 6	25	1374	37.3	62.0	24.8
2 < 5	25	1399	38.2	63.2	25.0
5 > 6	24	1423	39.1	64.2	25.2
7 > 10	24	1447	40.0	65.3	25.3
2 > 8	23	1470	40.9	66.4	25.5
1 > 2	23	1493	41.8	67.4	25.6
2 < 7	23	1516	42.7	68.4	25.7
1 > 5	22	1538	43.6	69.4	25.8
5 > 8	22	1560	44.5	70.4	25.9
9 > 10	21	1581	45.5	71.4	25.9
5 < 8	21	1602	46.4	72.3	26.0
1 < 4	21	1623	47.3	73.3	26.0
1 < 5	21	1644	48.2	74.2	26.0
1 < 2	20	1664	49.1	75.1	26.0
7 < 8	20	1684	50.0	76.0	26.0
9 < 10	20	1704	50.9	76.9	26.0
2 < 8	20	1724	51.8	77.8	26.0
6 > 8	20	1744	52.7	78.7	26.0
6 > 7	19	1763	53.6	79.6	26.0

1 > 8	18	1781	54.5	80.4	25.9
6 < 8	17	1798	55.5	81.2	25.7
4 < 6	17	1815	56.4	81.9	25.6
7 < 10	15	1830	57.3	82.6	25.3
1 > 4	15	1845	58.2	83.3	25.1
4 < 8	15	1860	59.1	84.0	24.9
5 < 6	15	1875	60.0	84.7	24.7
2 < 11	15	1890	60.9	85.3	24.4
7 > 8	15	1905	61.8	86.0	24.2
2 > 7	14	1919	62.7	86.6	23.9
2 > 5	14	1933	63.6	87.3	23.6
9 > 11	14	1947	64.5	87.9	23.4
7 < 11	13	1960	65.5	88.5	23.0
4 > 6	13	1973	66.4	89.1	22.7
6 < 7	13	1986	67.3	89.7	22.4
10 > 11	12	1998	68.2	90.2	22.0
2 > 6	12	2010	69.1	90.7	21.7
2 > 4	11	2021	70.0	91.2	21.2
1 > 6	11	2032	70.9	91.7	20.8
4 < 7	11	2043	71.8	92.2	20.4
1 < 7	10	2053	72.7	92.7	20.0
7 < 9	9	2062	73.6	93.1	19.5
1 < 10	9	2071	74.5	93.5	19.0
5 < 7	9	2080	75.5	93.9	18.5
5 < 9	8	2088	76.4	94.3	17.9
6 < 10	8	2096	77.3	94.6	17.4
1 < 11	8	2104	78.2	95.0	16.8
2 < 9	8	2112	79.1	95.3	16.3
2 < 10	8	2120	80.0	95.7	15.7
1 < 9	7	2127	80.9	96.0	15.1
8 < 10	7	2134	81.8	96.3	14.5
6 < 9	6	2140	82.7	96.6	13.9

5 < 11	6	2146	83.6	96.9	13.2
8 < 11	6	2152	84.5	97.2	12.6
2 < 3	6	2158	85.5	97.4	12.0
4 < 9	5	2163	86.4	97.7	11.3
3 > 10	5	2168	87.3	97.9	10.6
6 < 11	5	2173	88.2	98.1	9.9
4 < 5	5	2178	89.1	98.3	9.2
3 > 8	5	2183	90.0	98.6	8.6
5 < 10	4	2187	90.9	98.7	7.8
8 < 9	4	2191	91.8	98.9	7.1
4 < 10	4	2195	92.7	99.1	6.4
3 > 9	4	2199	93.6	99.3	5.6
3 > 5	3	2202	94.5	99.4	4.9
3 > 11	3	2205	95.5	99.5	4.1
4 < 11	3	2208	96.4	99.7	3.3
3 > 7	2	2210	97.3	99.8	2.5
3 > 4	2	2212	98.2	99.9	1.7
3 > 6	2	2214	99.1	100.0	0.9
1 < 3	1	2215	100.0	100.0	0.0
Total Frequency	**2215**	Equal Total Frequency	Equals 100%	Equals 100%	Power = E-D

Table B1. Phase 1 Full Power Analysis Table from Pareto Protocol (Cutoff Highlighted)

Affinity Pair				Affinity Pair				Affinity Pair				Affinity Pair		
1	→	2		2	→	8		4	→	8		7	←	8
1	→	3		2	→	9		4	→	9		7	→	9
1	←	4		2	→	10		4	→	10		7	→	10
1	→	5		2	→	11		4	→	11		7	→	11
1	←	6		3	←	4		5	→	6		8	→	9
1	→	7		3	←	5		5	→	7		8	→	10
1	←	8		3	←	6		5	→	8		8	→	11
1	→	9		3	←	7		5	→	9		9	→	10
1	→	10		3	←	8		5	→	10		9	←	11
1	→	11		3	←	9		5	→	11		10	←	11
2	→	3		3	←	10		6	→	7				
2	←	4		3	←	11		6	→	8				
2	←	5		4	→	5		6	→	9		Conflict		
2	←	6		4	←	6		6	→	10				
2	←	7		4	→	7		6	→	11				

Table B2. Affinity Relationship Table for Construction of Composite System Influence Diagram

Table B2 indicates all of the affinity pair relationships used for the construction of the Phase 1 composite System Influence Diagram. Highlighted pairs are conflicts, those that appeared twice above the cutoff value in the Phase 1 Power Analysis Table (Table B1), once for each direction of influence between affinities. The direction of the highlighted relationships was the relationship pairing that received the higher of the two competing votes from the ART respondents. This information was then transferred to the tabular Interrelationship Diagram (IRD; Table B3), indicating all of the relationships that affect or influence each affinity (*In*: B → A and A ← B), and all of the relationships influenced *by* each affinity (*Out*: A → B and B ← A).

Tabular IRD														
	1	2	3	4	5	6	7	8	9	10	11	OUT	IN	Δ
1		↑	↑	←	↑	←	↑	←	↑	↑	↑	7	3	4
2	←		↑	←	←	←	←	↑	↑	↑	↑	5	5	0
3	←	←		←	←	←	←	←	←	←	←	0	10	-10
4	↑	↑	↑		↑	←	↑	↑	↑	↑	↑	9	1	8
5	←	↑	↑	←		↑	↑	↑	↑	↑	↑	8	2	6
6	↑	↑	↑	↑	←		↑	↑	↑	↑	↑	9	1	8
7	←	↑	↑	←	←	←		←	↑	↑	↑	5	5	0
8	↑	←	↑	←	←	←	↑		↑	↑	↑	6	4	2
9	←	←	↑	←	←	←	←	←		↑	←	2	8	-6
10	←	←	↑	←	←	←	←	←	←		←	1	9	-8
11	←	←	↑	←	←	←	←	←	↑	↑		3	7	-4

Table B3. Phase 1 Tabular IRD of Affinity Relationship Table from Power Analysis

Tabular IRD – Sorted in Descending Order of Δ														
	1	2	3	4	5	6	7	8	9	10	11	OUT	IN	Δ
4	↑	↑	↑		↑	←	↑	↑	↑	↑	↑	9	1	8
6	↑	↑	↑	↑	←		↑	↑	↑	↑	↑	9	1	8
5	←	↑	↑	←		↑	↑	↑	↑	↑	↑	8	2	6
1		↑	↑	←	↑	←	↑	←	↑	↑	↑	7	3	4
8	↑	←	↑	←	←	←	↑		↑	↑	↑	6	4	2
2	←		↑	←	←	←	←	↑	↑	↑	↑	5	5	0
7	←	↑	↑	←	←	←		←	↑	↑	↑	5	5	0
11	←	←	↑	←	←	←	←	←	↑	↑		3	7	-4
9	←	←	↑	←	←	←	←	←		↑	←	2	8	-6
10	←	←	↑	←	←	←	←	←	←		←	1	9	-8
3	←	←		←	←	←	←	←	←	←	←	0	10	-10

Table B4. Phase 1 Tabular IRD in Descending Delta Order

Table B4 indicates the "delta" order (relative position of that affinity within the system) of each affinity. This sorted IRD produced the following tentative System Influence Diagram placement:

#	Affinity Name	Location/Assignment
4	Group Establishment/Formation	Secondary Driver
6	Incentives/Motivation	Secondary Driver
5	Group Roles	Secondary Driver
1	Communication	Secondary Driver
8	Relationships	Secondary Driver
2	Emotions	Pivot
7	Logistics	Pivot
11	Teamwork	Secondary Outcome
9	Synergy	Secondary Outcome
10	Task Focus	Secondary Outcome
3	Final Product/Resolution	Primary Outcome

Table B5. Phase 1 Tentative System Influence Diagram Assignments

An affinity marked by a high positive delta (many *Out* but no *In* relationships) is a *Primary Driver,* a significant cause that affects many other affinities, but is not affected by others. *Secondary Drivers* (more *Outs* than *Ins*) are relative causes or influences on other affinities. Unlike the focus groups' systems, the composite System Influence Diagram had no primary drivers, suggesting that the collective perceptions of group work using the new affinity definitions was less deterministic, allowing for greater feedback and on-going adjustments to the system. Affinities with equal numbers of *Ins* and *Outs* are *Pivots*, a position in the middle of the system that suggests a "circulator" in the final representation. Such affinities may feed back to affect earlier parts of the system, feed forward to affect downstream issues, or affect multiple affinities at once. The *Secondary Outcomes* have more *Ins* than *Outs* and reveal relative effects, downstream issues that are more appropriate to consider after many of the driving factors have left their mark on the system, but may still influence other aspects of the system themselves. Finally, an affinity with many *Ins* but no *Outs* is a *Primary Outcome*, a significant affect that is caused by many of the affinities, but does not affect any others.

Using the tentative SID assignments from Table B5 and the specific affinity-pair relationships that survived the MinMax criterion provided in Table B2, the Cluttered System Influence Diagram (SID) that appears in Chapter IV, Figure 2, was constructed. This cluttered SID would later be reconciled with conflicting relationships (A $\rightarrow$ B and A $\leftarrow$ B relationships that appeared above the cutoff) to ultimately produce the Pareto-Reconciled Uncluttered System Influence Diagram, the graphical representation of the communicative context as illustrated in Chapter IV, Figure 4. These same data reduction and representation procedures were also used to construct the individual interview SID—the graphical representation of the study participants' perceptions and experiences during Phase 3 of the study. They began with Table B6, the full power analysis table for the Phase 3 interview data.

Affinity Pair Relationship	Frequency Sorted (Descending)	Cumulative Frequency	Cumulative Percent (Relation)	Cumulative Percent (Frequency)	Power
3 < 6	21	21	0.9	2.0	1.1
3 < 7	21	42	1.8	4.1	2.3
3 < 11	21	63	2.7	6.1	3.4
1 > 3	20	83	3.6	8.1	4.4
3 < 9	20	103	4.5	10.0	5.5
4 > 8	20	123	5.5	12.0	6.5
6 > 10	20	143	6.4	13.9	7.6
1 > 8	19	162	7.3	15.8	8.5
4 > 11	19	181	8.2	17.6	9.4
5 > 11	19	200	9.1	19.5	10.4
8 > 9	19	219	10.0	21.3	11.3
8 > 11	19	238	10.9	23.2	12.3
1 > 5	18	256	11.8	24.9	13.1
1 > 10	18	274	12.7	26.7	14.0
3 < 5	18	292	13.6	28.4	14.8
3 < 8	18	310	14.5	30.2	15.6
4 > 5	18	328	15.5	31.9	16.5
5 > 7	18	346	16.4	33.7	17.3
6 > 11	18	364	17.3	35.4	18.2
1 > 7	17	381	18.2	37.1	18.9
3 < 10	17	398	19.1	38.8	19.7
1 > 2	16	414	20.0	40.3	20.3
2 > 8	16	430	20.9	41.9	21.0
4 > 10	16	446	21.8	43.4	21.6
5 > 9	16	462	22.7	45.0	22.3
1 > 4	15	477	23.6	46.4	22.8
2 > 3	15	492	24.5	47.9	23.4
2 > 11	15	507	25.5	49.4	23.9
4 > 9	15	522	26.4	50.8	24.5
8 > 10	15	537	27.3	52.3	25.0

2 < 6	14	551	28.2	53.7	25.5
3 < 4	14	565	29.1	55.0	25.9
5 > 10	14	579	30.0	56.4	26.4
9 < 10	14	593	30.9	57.7	26.8
1 > 9	13	606	31.8	59.0	27.2
1 > 11	13	619	32.7	60.3	27.5
2 < 7	13	632	33.6	61.5	27.9
6 > 7	13	645	34.5	62.8	28.3
9 < 11	13	658	35.5	64.1	28.6
2 > 10	12	670	36.4	65.2	28.9
4 > 7	12	682	37.3	66.4	29.1
5 < 8	12	694	38.2	67.6	29.4
6 > 8	12	706	39.1	68.7	29.7
7 < 8	12	718	40.0	69.9	29.9
2 < 4	11	729	40.9	71.0	30.1
2 > 5	11	740	41.8	72.1	30.2
6 > 9	11	751	42.7	73.1	30.4
7 < 10	11	762	43.6	74.2	30.6
7 > 11	11	773	44.5	75.3	30.7
10 > 11	11	784	45.5	76.3	30.9
10 < 11	11	795	46.4	77.4	31.0
5 > 8	10	805	47.3	78.4	31.1
7 > 10	10	815	48.2	79.4	31.2
2 < 10	9	824	49.1	80.2	31.1
5 < 6	9	833	50.0	81.1	31.1
7 > 9	9	842	50.9	82.0	31.1
2 < 5	8	850	51.8	82.8	30.9
2 > 9	8	858	52.7	83.5	30.8
4 < 6	8	866	53.6	84.3	30.7
7 < 11	8	874	54.5	85.1	30.6
1 > 6	7	881	55.5	85.8	30.3
2 < 9	7	888	56.4	86.5	30.1

7 < 9	7	895	57.3	87.1	29.9
1 < 6	6	901	58.2	87.7	29.5
2 < 3	6	907	59.1	88.3	29.2
2 > 6	6	913	60.0	88.9	28.9
2 < 11	6	919	60.9	89.5	28.6
6 < 8	6	925	61.8	90.1	28.2
1 < 2	5	930	62.7	90.6	27.8
1 < 4	5	935	63.6	91.0	27.4
2 > 4	5	940	64.5	91.5	27.0
2 > 7	5	945	65.5	92.0	26.6
2 < 8	5	950	66.4	92.5	26.1
7 > 8	5	955	67.3	93.0	25.7
9 > 10	5	960	68.2	93.5	25.3
3 > 10	4	964	69.1	93.9	24.8
4 > 6	4	968	70.0	94.3	24.3
8 < 10	4	972	70.9	94.6	23.7
9 > 11	4	976	71.8	95.0	23.2
3 > 4	3	979	72.7	95.3	22.6
5 > 6	3	982	73.6	95.6	22.0
5 < 10	3	985	74.5	95.9	21.4
5 < 11	3	988	75.5	96.2	20.7
6 < 7	3	991	76.4	96.5	20.1
6 < 9	3	994	77.3	96.8	19.5
8 < 9	3	997	78.2	97.1	18.9
8 < 11	3	1000	79.1	97.4	18.3
1 < 3	2	1002	80.0	97.6	17.6
1 < 5	2	1004	80.9	97.8	16.9
1 < 10	2	1006	81.8	98.0	16.1
3 > 8	2	1008	82.7	98.1	15.4
4 < 7	2	1010	83.6	98.3	14.7
4 < 8	2	1012	84.5	98.5	14.0
4 < 10	2	1014	85.5	98.7	13.3

5 < 7	2	1016	86.4	98.9	12.6
1 < 7	1	1017	87.3	99.0	11.8
1 < 8	1	1018	88.2	99.1	10.9
1 < 9	1	1019	89.1	99.2	10.1
1 < 11	1	1020	90.0	99.3	9.3
3 > 5	1	1021	90.9	99.4	8.5
3 > 6	1	1022	91.8	99.5	7.7
3 > 7	1	1023	92.7	99.6	6.9
4 < 5	1	1024	93.6	99.7	6.1
4 < 11	1	1025	94.5	99.8	5.3
6 < 10	1	1026	95.5	99.9	4.4
6 < 11	1	1027	96.4	100.0	3.6
3 > 9	0	1027	97.3	100.0	2.7
3 > 11	0	1027	98.2	100.0	1.8
4 < 9	0	1027	99.1	100.0	0.9
5 < 9	0	1027	100.0	100.0	0.0
Total Frequency	**1027**	Equal Total Frequency	Equals 100%	Equals 100%	Power = E-D

Table B6. Phase 3 Full Power Analysis Table from Pareto Protocol (Cutoff Highlighted)

Affinity Pair				Affinity Pair				Affinity Pair				Affinity Pair		
1	→	2		2	→	8		4	→	8		7	←	8
1	→	3		2	→	9		4	→	9		7	→	9
1	→	4		2	→	10		4	→	10		7	←	10
1	→	5		2	→	11		4	→	11		7	→	11
1	→	6		3	←	4		5	←	6		8	→	9
1	→	7		3	←	5		5	→	7		8	→	10
1	→	8		3	←	6		5	←	8		8	→	11
1	→	9		3	←	7		5	→	9		9	←	10
1	→	10		3	←	8		5	→	10		9	←	11
1	→	11		3	←	9		5	→	11		10	←	11
2	→	3		3	←	10		6	→	7				
2	←	4		3	←	11		6	→	8				
2	→	5		4	→	5		6	→	9		Conflict		
2	←	6		4	←	6		6	→	10				
2	←	7		4	→	7		6	→	11				

Table B7. Phase 3 Affinity Relationship Table

Table B7 again represents the various relationships and conflicts that appeared above the cutoff value from the full power analysis table (Table B6). The study participants' relationship data were then transferred to another tabular Interrelationship Diagram (IRD, Table B8) and sorted in descending order of delta (Table B9). The resulting list of affinity precedence (Table B10) indicated the relative position of the affinities within the final system and was used to construct the final Phase 3 Pareto-Reconciled Uncluttered SID (Chapter VIII, Figure 11).

Tabular IRD														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**OUT**	**IN**	**Δ**
1		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	10	0	10
2	←		↑	←	↑	←	←	↑	↑	↑	↑	6	4	2
3	←	←		←	←	←	←	←	←	←	←	0	10	-10
4	←	↑	↑		↑	←	↑	↑	↑	↑	↑	8	2	6
5	←	←	↑	←		←	↑	←	↑	↑	↑	5	5	0
6	←	↑	↑	↑	↑		↑	↑	↑	↑	↑	9	1	8
7	←	↑	↑	←	←	←		←	↑	←	↑	4	6	-2
8	←	←	↑	←	↑	←	↑		↑	↑	↑	6	4	2
9	←	←	↑	←	←	←	←	←		←	←	1	9	-8
10	←	←	↑	←	←	←	↑	←	↑		←	3	7	-4
11	←	←	↑	←	←	←	←	←	↑	↑		3	7	-4

Table B8. Phase 3 Tabular IRD of Affinity Relationship Table from Power Analysis

Tabular IRD – Sorted in Descending Order of Δ														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**OUT**	**IN**	**Δ**
1		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	10	0	10
6	←	↑	↑	↑	↑		↑	↑	↑	↑	↑	9	1	8
4	←	↑	↑		↑	←	↑	↑	↑	↑	↑	8	2	6
2	←		↑	←	↑	←	←	↑	↑	↑	↑	6	4	2
8	←	←	↑	←	↑	←	↑		↑	↑	↑	6	4	2
5	←	←	↑	←		←	↑	←	↑	↑	↑	5	5	0
7	←	↑	↑	←	←	←		←	↑	←	↑	4	6	-2
10	←	←	↑	←	←	←	↑	←	↑		←	3	7	-4
11	←	←	↑	←	←	←	←	←	↑	↑		3	7	-4
9	←	←	↑	←	←	←	←	←		←	←	1	9	-8
3	←	←		←	←	←	←	←	←	←	←	0	10	-10

Table B9. Phase 3 Tabular IRD in Descending Delta Order

#	Affinity Name	Location/Assignment
1	Communication	Primary Driver
6	Incentives/Motivation	Secondary Driver
4	Group Establishment/Formation	Secondary Driver
2	Emotions	Secondary Driver
8	Relationships	Secondary Driver
5	Group Roles	Pivot
7	Logistics	Secondary Outcome
11	Teamwork	Secondary Outcome
10	Task Focus	Secondary Outcome
9	Synergy	Secondary Outcome
3	Final Product/Resolution	Primary Outcome

Table B10. Phase 3 Tentative System Influence Diagram Assignments

Appendix C: Task and Interview Materials

A. DAY ONE TASK

You have been a passenger on a sight-seeing plane that has crashed in the Mojave Desert. The flight began early in the morning and it not yet mid-day. The pilot and copilot have been killed and the only survivors are the people in your group. You and a few of the fellow passengers were able to retrieve a number of items from the plane before it caught fire.

As a group:

1) Decide on an order (from 1 to 11) for these items in terms of importance for survival
2) For each item on the list, the group must reach consensus about its importance in the list
3) Provide your group's planned or expected use for each item on the list
4) Provide a rationale for why you ordered it between the items above and below it

Map of desert
Salt tablets
Parachute
Rain coats
Mirror
Compass
Book (edible plants of the desert)
Flashlight (working)
Pistol (loaded)
Fifth of whiskey
Hunting knife

You have 15 minutes to complete this task…

B. DAY TWO TASK

Take some time to generate some ideas that will improve the quality of the physical environment at UT Austin or in the Austin metro area in general.

As a group:

1) Strive to produce ideas that would have
    (a) maximal impact in improving the environment AND
    (b) maximal feasibility of implementation
2) Generate as many ideas as possible but be sure to keep track of them
3) Decide as a group which idea you will implement and describe why
4) Develop a list of requirements, support, or resources that will be needed to implement the chosen idea.

You have 15 minutes to complete this task…

C. DAY THREE TASK

Your group will be asked to settle a situation in which a college student bribed an instructor to change his grade in a course. The following pages describe the circumstances and the possible courses of action. Your task is to work as a group and determine which courses of disciplinary action to choose for the student and the teaching assistant (T.A.). Your group should consider the consequences of the different actions when making its decision.

There are several departments on campus that have preferences for how this matter should be settled, strive to take into account the concerns of as many parties as possible. Please take a moment to read the details of the case:

This case involves determining the disciplinary actions for a situation in which a college student athlete has been found guilty of bribing an instructor to change his grade in a course. This event took place at a prestigious liberal arts college in the eastern U.S. The student, Jack, is a star athlete on the college basketball team. He leads the team in points, assists, blocked shots, and rebounds. He is very popular and has drawn larger crowds at the game than in previous seasons, substantially increasing the college's revenues due to athletics. In fact, Jack is such a good player and is so popular that the school has received a great deal of positive attention from the press, enhancing the college's reputation and attracting student enrollment.

Jack had been concerned about a grade in one of his courses. He needed a B or better on the midterm exam to get a B in the course and remain eligible to play basketball. He received a D on the midterm. To maintain his eligibility, he offered $200 to the course's graduate student teaching assistant to change his exam grade to a B. The teaching assistant, Tom, accepted the offer.

Another teaching assistant learned of the incident and reported both Jack and Tom to the administration. When confronted, Jack and Tom admitted to what they had done.

As the disciplinary action committee, your group's task is to choose the best courses of disciplinary action. There are five issues to settle in the case. Three issues pertain to disciplining Jack; including what to do about Jack's grade in the course, his status on the basketball team, and his status as a college student. The other two issues pertain to disciplining Tom; these issues include deciding what to do about Tom's status as an instructor and his status as a graduate student. When considering the alternatives for each issue, you should consider the consequences of the various options. In addition, be sure that you do not choose an illogical combination of alternatives (e.g. if you decide to suspend him from the academic program for one semester, then he cannot be suspended from playing basketball for only one game; if you decide to expel Tom from school, then he cannot work for the college as a teacher). The following information describes the different departments' preferences and the possible courses of disciplinary action for each of the five matters.

The athletic department does not condone cheating; however, it does not want to lose Jack from the team due to a suspension or expulsion. With Jack on the team, the school has a good chance at wining the conference championship. Without Jack, the college is unlikely

to win the championship. In addition, the money brought in from attendance at the games due to Jack's popularity has increased this department's resources, which it does not want to lose. On the grounds that extreme punishment for either Jack or Tom would only hurt the school and serve no useful purpose, the athletic department supports a lenient course of disciplinary action.

The college faculty wishes to uphold the highest academic and ethical principles. After all, the main purpose of the college is as an academic institution. The faculty believes that cheating is reprehensible; is it the academic equivalent of theft and fraud, and the harshest punishment should be given to both Jack and Tom. In addition, a harsh and publicized disciplinary action will send a message to others that cheating is not tolerated at this college. This message will have a positive effect on the college's reputation for high academic standards. If the punishment is too light, then a precedent of lenience will be set for cases in the future, conveying the message that cheating is condoned, or it will convey a message that different standards apply to different students.

The college's administration wants a solution that takes into account the preferences of both the athletic department and faculty positions and protects the college's public image. The administration wants to ensure the continued success of the athletic program. It also wants to uphold the college's academic standards and principles. Both the athletic and academic programs have contributed to the college's positive reputation. The administration is concerned that this matter be handled very carefully or the college may jeopardize its reputation, future enrollment, and financial support from other institutions and alumni.

As a committee, your task is to agree on how to settle this matter. You all must agree on one option to resolve each of the five issues. Remember, you must strive to make sure your solution takes into account the concerns of all parties.

Issues and possible courses of action:

Issue 1: Jack's grade in the course

- 1a. Give Jack his original grade on the exam (a D).
- 1b. Give Jack a failing grade on the exam.
- 1c. Give Jack a failing grade in the course.

Issue 2: Jack's status on the basketball team

- 2a. Make no change in Jack's basketball eligibility.
- 2b. Suspend Jack from the next basketball game.
- 2c. Suspend Jack from the basketball team for the rest of the season.
- 2d. Suspend Jack from the basketball team for an indefinite length of time and require that he appeal to be reinstated.
- 2e. Kick Jack off the team.

Issue 3: Jack's status as a college student

- 3a. Make no change in Jack's college status.
- 3b. Give Jack a warning, stating that if he is involved in another incident involving cheating in the future, he will be expelled.
- 3c. Suspend Jack from college (classes and athletics) for the rest of the semester.

3d. Suspend Jack from the college for an indefinite length of time and require that he appeal for re-admittance.
3e. Expel Jack from the college.

Issue 4: Tom's status as an instructor (note: If Tom is restricted from teaching, he loses a source of income that helps pay his way through graduate school.)
4a. Make no change in Tom's teaching status.
4b. Give Tom a reprimand to be placed in his permanent record, which will be seen by potential employers after is finished with school.
4c. Suspend Tom from teaching for the rest of the semester
4d. Suspend Tom from teaching for an indefinite length of time and require that he appeal to be reinstated.
4e. Do not allow Tom to teach again during his time remaining in graduate school

Issue 5: Tom's status as a graduate student
5a. Make no change in Tom's college status
5b. Give Tom a warning, stating that if he is involved in another incident involving cheating in the future, he will be expelled.
5c. Suspend Tom from the college for the rest of the semester.
5d. Suspend Tom from the college for an indefinite length of time and require that he appeal for re-admittance.
5e. Expel Tom from the college.

You have 15 minutes to complete this task…please discuss this case as a group and try to resolve as many issues as possible.
1) Choose and agree on an option for each issue.
2) Indicate your rationale for choosing each option.

E. INTERVIEW HANDOUT

The central portion of this interview revolves around several major themes or issues that may have played a large or small part in your thinking, reactions, or experiences during the course of your three days in the study. We'll go through each of these major themes one at a time and I've provided you a short set of their definitions below for you to refer back to during the interview. We'll start with your general impressions of each of these items and then get into more specifics.

I'd like you to focus primarily on what happened during this study; but if something strikes you as particularly noteworthy or perhaps unusual in relation to your other experiences working in other groups, please feel free to share those thoughts as well. I'm really interested in your insights as well as your observations about your group experience so I'll probably be asking you a lot of why or explanation questions as opposed to lots of yes/no questions. Please remember that all of your responses are completely confidential; none of your answers will be shared with any other members of the study group and all identifying information about you will be removed from the final report.

Incentives/Motivation
Rewards (tangible or intangible) received from participating in or completing the group project, whether such rewards provide motivation for individual and group effort, and the equity with which those rewards are distributed throughout the group

Group Establishment/Formation
Issues relating to the circumstances surrounding the formation or establishment of the group itself
– How the group was formed: choose partners, assigned group membership
– Size: working with large vs. small groups, preferences for one over other

Communication
The means, methods or technologies used to communicate between group members (i.e. face-to-face, telephone, e-mail, Blackboard, etc.), as well as the importance of using those channels to conduct and coordinate activities and keeping those channels open between group members.

Group Roles
Deciding who will be the group's leader(s) to provide the driving force, take responsibility, or guide the group's activities. Also what roles other members will play and how those roles are decided.

Relationships
Relational/interpersonal issues associated with being around other people:
- POSTIVE: compromise, respect, networking, belonging, support, professionalism, identity
- NEGATIVE: conflict and argument, struggles for power and control, ego issues

Logistics
End-to-end management of the group and project lifecycle including:
- setting/sharing common goals or understanding of vision
- planning when, where, and how often the group meets
- balancing competing demands (leisure, sleep, other classes/projects, etc.) to devote to project

- processes or evaluations to keep the project moving, on track, and meeting deadlines (milestones,
organizational/workflow schemes, quality checks and reviews)

Emotions
- POSITIVE: confidence, humorous/happy, fun, motivated, fulfilled, satisfied, relief
- NEGATIVE: stress, overload, frustration, anxiety, guilt, fear, worry, low self-esteem, confusion, discouragement, resentment, disappointment

Teamwork
Issues associated with working with other people on a common task
- POSITIVE: teamwork, cooperation, equity of effort
- NEGATIVE: slacking, social loafing, inequities in work/effort

Synergy
Primarily an intellectual or resource-based outcome based on the sharing of a diversity of individual skills, experience, knowledge, ideas, and interpretations to create something better than could be accomplished alone.

Task Focus
Staying on track, mentally focusing on the work, keeping on the appropriate topics, avoiding digressions.

Final Product/Resolution
The resolution of the group project itself, i.e. the deliverable of the project or end result of the group's efforts

Influence
An instrumental force or inducement exchanged between individuals for the purposes of changing or preserving behavioral or psychological states; i.e. what you say or do to get someone else to do, say, feel, or believe as you want them to.

Many of the themes we discussed have some kind of relationship between them; one affects the outcome or causes the other to occur—or your feelings or reactions to one influences your feelings and reactions to another. Let's look at each theme and decide if or how it relates to each other theme. Tell me about your experiences with such relationships. Please give specific examples of how the relationships have affected your experience.

Theme/Issue
1. Communication
2. Emotions
3. Final Product/Resolution
4. Group Establishment/Formation
5. Group Roles
6. Incentives/Motivation
7. Logistics
8. Relationships
9. Synergy
10. Task Focus
11. Teamwork

Possible Relationships
A → B
A ← B
A <> B (No Relationship)

Relationship Table

Relationship Pair			Relationship Pair			Relationship Pair			Relationship Pair	
1	2		2	8		4	8		7	8
1	3		2	9		4	9		7	9
1	4		2	10		4	10		7	10
1	5		2	11		4	11		7	11
1	6		3	4		5	6		8	9
1	7		3	5		5	7		8	10
1	8		3	6		5	8		8	11
1	9		3	7		5	9		9	10
1	10		3	8		5	10		9	11
1	11		3	9		5	11		10	11
2	3		3	10		6	7			
2	4		3	11		6	8			
2	5		4	5		6	9			
2	6		4	6		6	10			
2	7		4	7		6	11			

AND Communication (Face-to-face, Chat/IM, Voice) -- Influence

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